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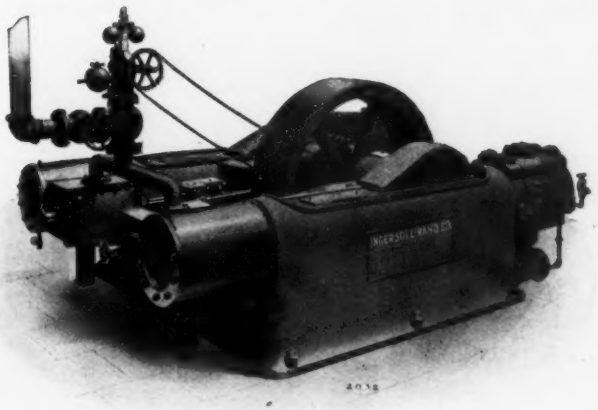

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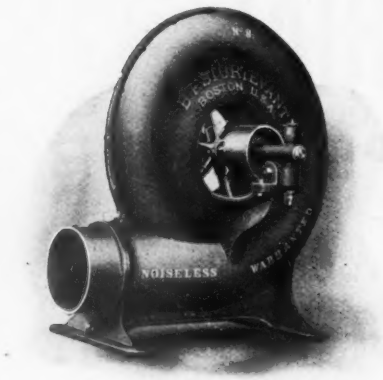

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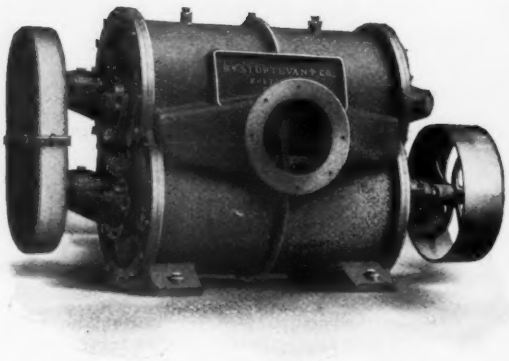

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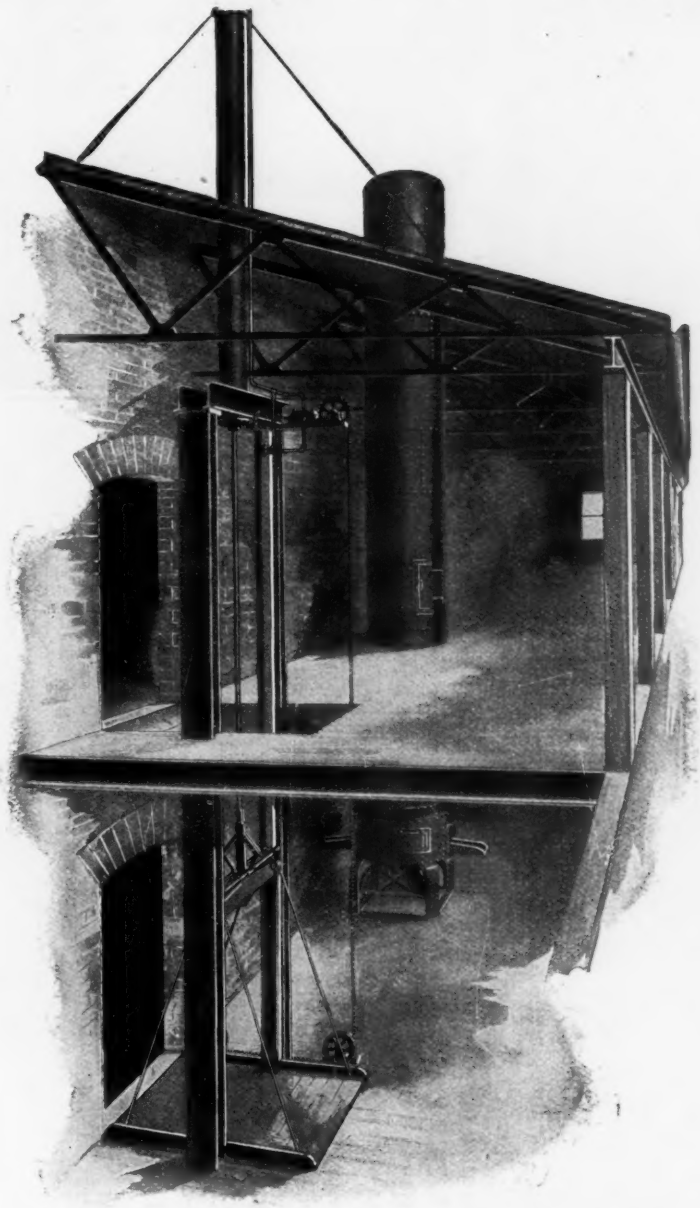
567

Pneumatic Foundry Elevators



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To put the stuff for a 30 ton heat from the ground to the cupola platform 15 feet high, by actual test, costs the immense sum of two cents (2 cts.). Coal was figured at $3.00 per ton and one pound of coal to evaporate 8 pounds of water.

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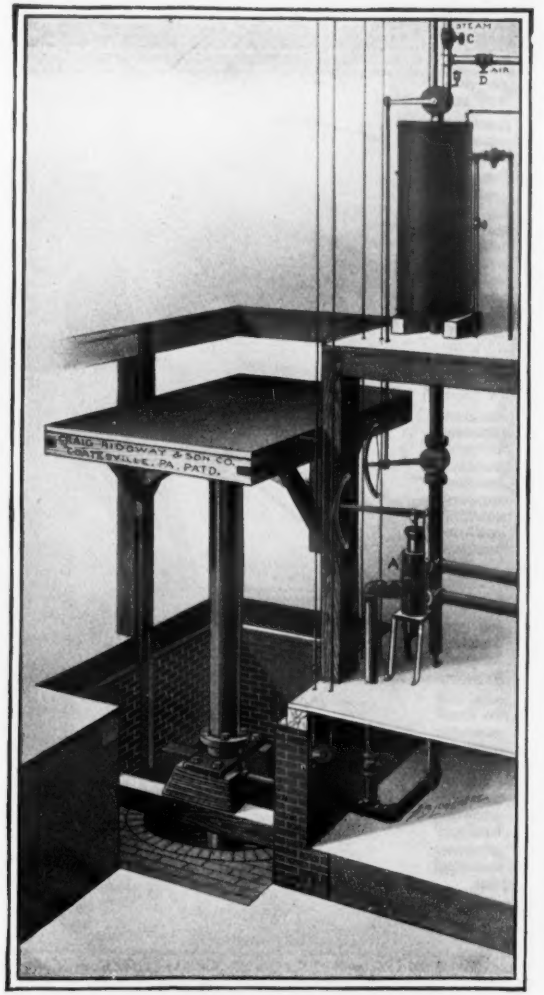

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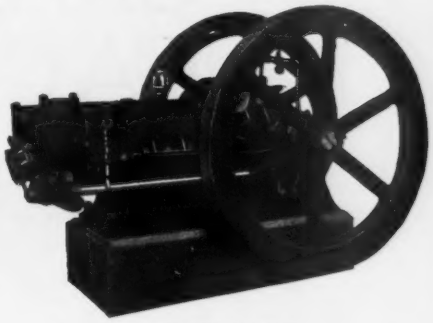

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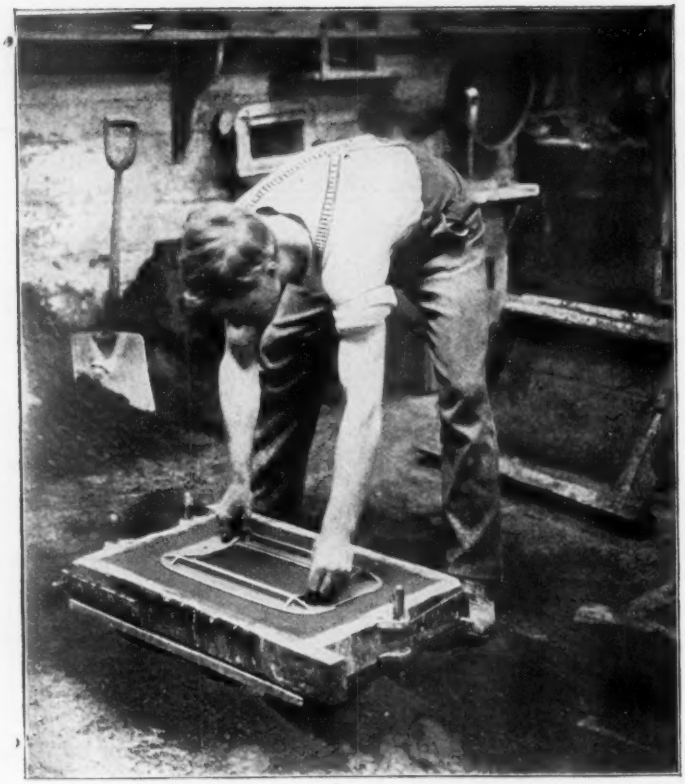

DIXON'S GRAPHITE FACINGS

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Operated by either steam or air

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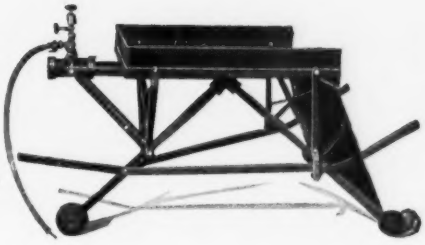

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We have some for immediate shipment.

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There's Always a Best. In Pig Iron It's Pioneer.

A high quality iron that's always soft, strong, uniform and clean. Used everywhere by foundrymen who want money-saving results. Only carefully selected ores and fuel from our own mines and ovens used in its manufacture.

Cut out the loss from defective castings— use Pioneer.

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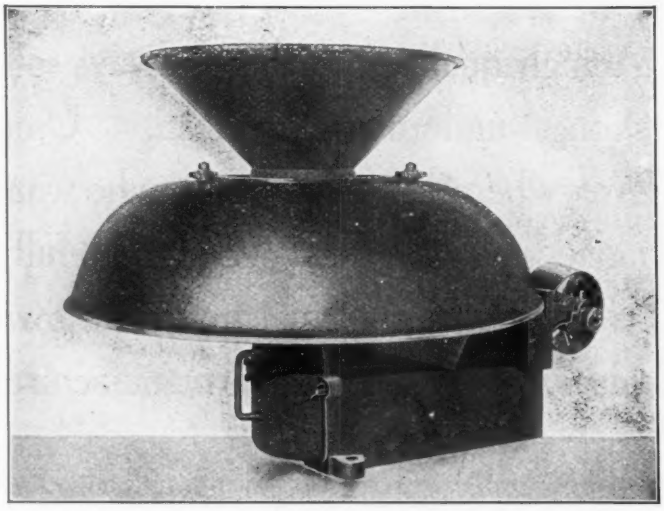

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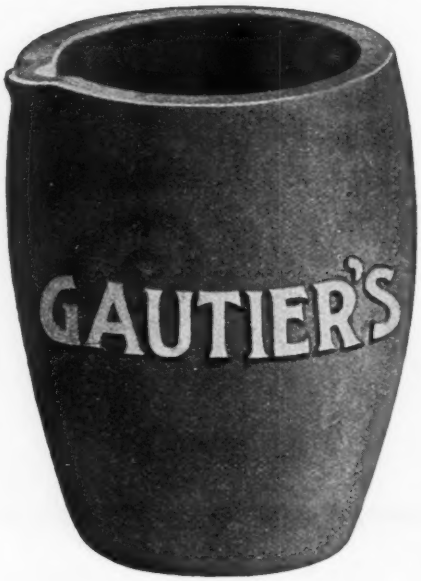

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What it is

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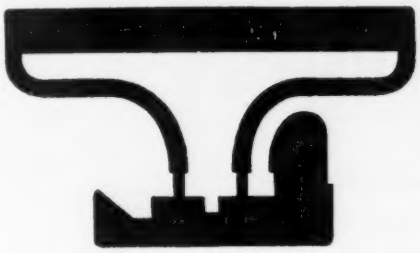

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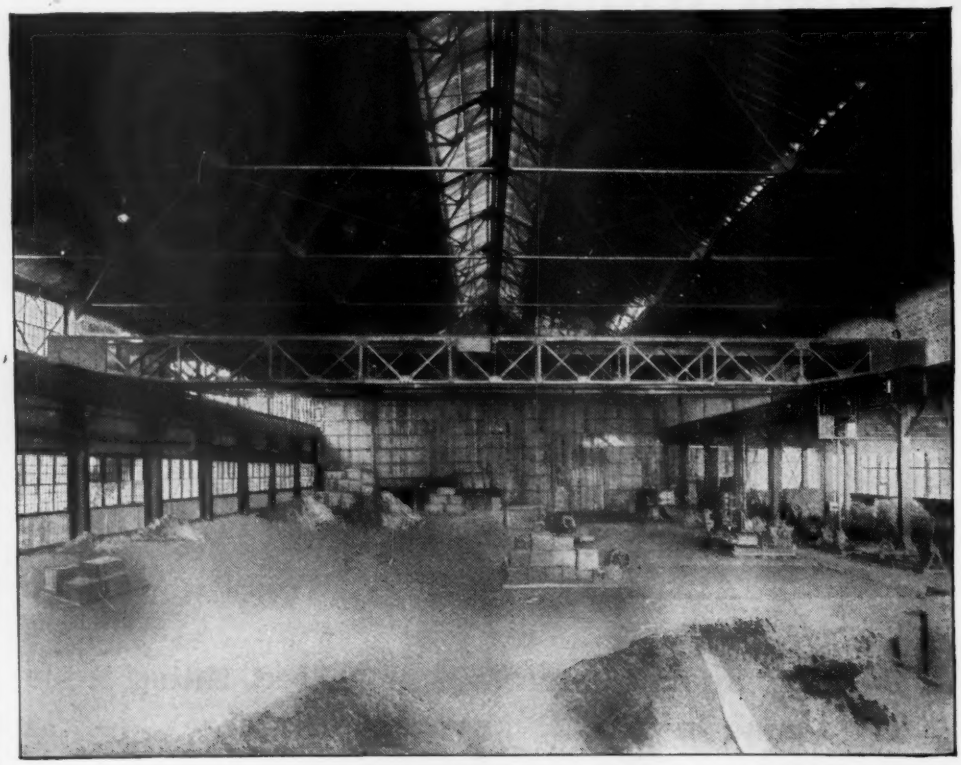

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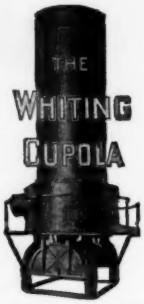

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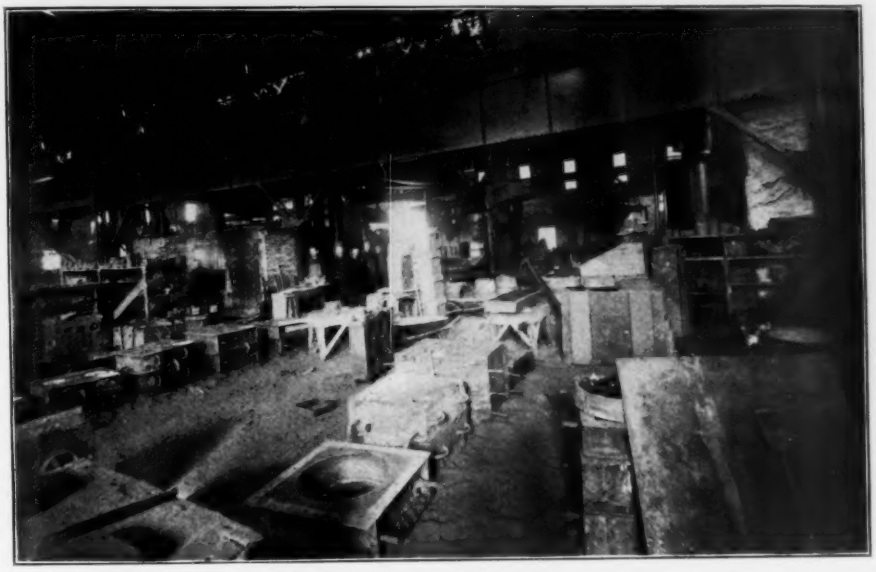
THE FOUNDRY

Vol. 28, No. 2. *CLEVELAND, OHIO, APRIL, 1906.* *Whole No. 164*

An Interesting Foundry Plant.

The Isaac G. Johnson Co.'s plant at Spuyten Duyvil, N. Y., is one of the most interesting foundries in the country.

It was started nearly fifty years ago by Mr. Johnson, and originally, the entire product was malleable iron castings. As Mr. Johnson's sons grew up, they were taken into the company, and at the same time, new lines were added. The company always produced steel castings of any composition, or to fill any specification, malleable and gray iron castings. The equipment includes crucible furnaces, modified open-hearth furnaces, Tropenas converters, air furnaces for gray iron and also for malleable iron, in addition to which, there are cupolas for melting the stock for the converters, or for making gray iron castings.



CORE DEPARTMENT AND PART OF THE FOUNDRY.

kept at the forefront of the latest and best foundry practice, believing that there is always a market for the highest grade product. Today, the output of the plant consists of steel castings, malleable iron castings and gun iron castings.

The company has grown until it occupies all of the site formerly occupied by the rolling mill formerly located on the property, and the equipment is of the best. Under the one management, are

The location of the plant is especially advantageous, as it is on the tracks of the New York Central railroad, and also has tide water facilities. A large portion of the supplies are received by water. The molding sand, clay, etc., come in by water, are unloaded by special machinery, and stored in a building, which has been specially designed for the purpose. The material is taken in small cars elevated above the roof of the build-

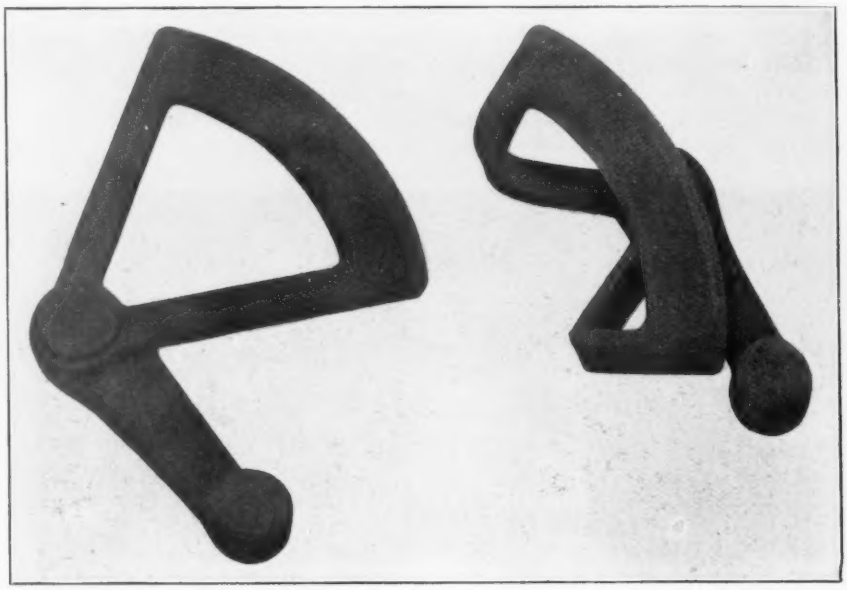
ing, when the cars are run out to positions above the various bins, and then discharged through hatches in the roof of the building. The sand for use is taken on industrial railway cars to the various sand preparing departments in the different sections of the works. For the steel practice, of course, there is installed a complete sand mixing and grinding plant, for the preparation of the molding sand, core sand, etc. Similar plants are also installed for the other foundries.

The steel foundry proper, consists of two long parallel buildings, each spanned by traveling cranes. The converters are located at one side of one of these buildings, and the core department is located between the two buildings, so that the cores have to be carried but a small distance in delivering them to the molders. The core ovens are arranged between the runways of the cranes in the two departments. For use in making heavy cores a power jib crane is installed in the core making department. For drying the molds for the steel castings, ovens are located at various points along the sides of the foundries.

At one end of one of the bays of the steel foundry proper, are located the furnaces for making open-hearth steel.

For the annealing of steel castings, a special department is provided adjoining the large steel foundry proper. This department is equipped with several different styles of annealing ovens for annealing both heavy and light castings.

The cleaning department is also located at one side of the steel foundry, between the foundry and the annealing department. Steel of special composition is frequently made in furnaces in other parts of the works, and especially, crucible steel.



A STEEL CASTING SHOWING HOW IT COULD BE BENT COLD.

In this connection, it will be of interest to know that it was the Isaac G. Johnson Co., which developed the armor piercing shells now used by our government. The company undertook a series of experiments for the government, in which they made a large number of shells of various composition. Finally, it was discovered, in connection with these experiments, that the application of a block of soft steel to the point of the finished shell would protect the point during the first impact, and enable it to penetrate the hardened armor. A patent for this soft block, attached to the point of the shell was taken out by the Isaac G. Johnson

Co., and subsequently sold to the government. This, however, is only one of the many special lines which have been worked out by the company for the benefit of various customers.

One of the accompanying ilustrations shows two castings for automobile parts. These castings were picked out of a pile of miscellaneous castings on the floor of the cleaning room by the writer. They were taken to the blacksmith's shop, and one of them bent cold, as shown in the illustration, without rupture. This is simply a sample of the light and accurate castings of strong and reliable metal, which are made by this company, and many more examples might be given.

A LARGE MALLEABLE CASTING.

The malleable department is no less interesting than the steel casting department. This company has never made an attempt to excell in tonnage, or to meet competition for a cheap grade of castings, but produces the best possible malleable castings of any required size or shape. The iron is all melted in straight draft or air furnaces, and the annealing carried on in specially designed annealing ovens. The process is not hurried at any point, but plenty of time it taken to produce the best possible work. The average foundryman is used to consider malleable castings of 50 or 60 pounds as about the limit of the possibility in this line, but the Isaac G. Johnson Co. is prepared to turn out malleable castings of almost any required size, providing the design of the piece is such that there are no great differences in the thickness of the metal.

One of the accompanying illustrations shows a ring for a special heater or boiler, which was turned out from the malleable department. These rings are made up to nearly 6 feet in diameter, and are remarkably good examples of foundry practice. The one shown happens to be one of the medium size castings, but, when it is compared with the man standing at the side, who is a large man, the size of the casting can be judged. Another view shows the core department and a portion of the foundry. A small crane is used in this department to handle heavy pieces, while the traveling crane runs over part of the floor. The small ovens are at the left, but the large ovens are not shown in this view.

The Isaac G. Johnson Co. has never had any labor troubles, nor is it likely to, for the working force has been gradually drawn together as the company has grown, and every one with whom the writer talked was very much interested in the plant and the success of the company for which he worked.

A profit sharing plan has been in force for a number of years, by which the superintendents and foremen share in the profits of the concern, in proportion to their wages, and also in proportion to their ability as dividend earners. This tends to keep the men interested and careful, and the company does not care to have anyone in its employ, who does not show sufficient interest to work for the welfare of the concern. The proportion of profit divided is a good percentage of the year's wages, and is a bonus well worth striving for.

At stated times, those in direct charge of the work hold a meeting, at which, all of the points of the business, which have come up since the previous meeting are carefully discussed, and, at this meeting, all points of difference between employes and employers are settled. By working in a friendly spirit, in this man-

ner, everything in the plant is kept in harmony.

The Isaac G. Johnson Co. has been not only successful, but, it has been conservative, and has always stood for the best possible product from its plant, and a policy of this kind is sure to win in the long run.

THE MANAGER'S TROUBLES.

BY O. W. KNOWS.

My experience in managing a small foundry trying to do a large business with a small capital has taught me a good many things. To start with my stock of experience was very limited. A foundry, like any other line of business, needs to be managed right. As a rule small and country foundries are started wrong, and the error not discovered until the owner has paid big prices for the discovery. The reader will see that the writer has paid his price. In the first place, the building itself is built too small, too low and too dark.

Some of my neighbors and fellow workmen have done me the honor to call me a molder by trade, but when I first entered the foundry business I was not a molder, and therefore paid well for whatever professional knowledge I have in the molding business. I had served an apprenticeship as a blacksmith, and managed to become proprietor for a small country shop doing all kinds of general repair work. In this line I had to secure castings of all kinds from a traction engine cylinder to a part for a toy locomotive.

Now I know that every blacksmith and machinist knows all about the molding business, and according to their knowledge the whole job of making castings consists of tamping some sand in a box, pulling out the spue stick, pouring in hot iron and shaking out perfect castings; but this is something that a molder cannot do, and I learned it to my sorrow. I also learned that there is a difference between different trades, but I am getting off my story. My business demanded a foundry; at least, all my customers thought so, and I was encouraged by them to start one. I started in with the intention of doing any and all kinds of foundry work. The beginner at first does not know of some of the snags he is going to run into and is liable not to consider that there is some difference between sand and iron. I thought how nice and handy it would be to make all kinds of reaper and mower repairs and furnish them to the hardware trade, also stove furniture and even the stoves themselves.

The first heat of sleigh shoes, bolster plates, rule irons, post mauls, flat iron, and sash weights came out very satisfactory; but it was necessary to have other lines of work to keep the molders busy, so I fitted up some stove kettles, patterns for spiders, pancake griddles, stove pipe shelves, and fancy picture frames. When I put the sleigh shoe molder to making kettles and stove hardware I soon learned that all classes of work and all molders were not alike. Both molder and patterns were changed, but the result in good kettles was the same—that is, a cipher for the kettles and a pile of scrap iron had to be melted over.

As there was no demand for sleigh shoes in the summer time it was necessary to get some line that would furnish work the year around. It was decided to make a cook stove. Patterns were purchased for three different sizes of stoves and work started on the stove castings. Before purchasing the patterns the molders were consulted, and oh yes, they knew all about casting stoves, but I had to pay dear of their finding out all the same, and finally learned that they knew nothing about it.

An expert stove plate molder was next secured and he immediately condemned my sand and flasks. A car load of sand suitable to his fancy was shipped in, the patterns were somewhat remodeled and new flasks made, when the making of stoves was begun in a systematic manner. A complete set of patterns for each stove was molded up so that we could see what the stoves looked like. From the first heat we secured a few legs and a lot

of scrap, also a grate or two with a few heavy pieces of similar nature.

The stove molder, however, said that the scrap iron would work in very well with some Scotch pig, which was a peculiar kind of iron necessary to make stoves, and one which required a great deal of scrap. We kept busy for a while, making a lot of scrap and a few castings until that Scotch pig arrived. Of course we expected the Scotch pig to be a cure for all our troubles, and when it arrived a heat was hastily molded up and the new iron given a chance. It proved to be some better, but it took two heats to secure enough good castings to finish one-half dozen stoves.

Of course anyone could put a stove together—that is what we had supposed, but with warped doors, cracked beds, thick and thin plates, lugs so hard they could not be drilled, castings full of coldshuts, hard spots, etc., we certainly had our troubles. The boss molder said that all of the trouble was due to dull iron, and we must use more coal, and also stated that the other men did not know how to pour the molds properly. He also said that the ladles were not properly lined, and he seemed to know a hundred other reasons.

For the next heat his instructions were followed to the letter, including the melting with limestone as a flux, the use of salt in the lining for the ladles, the putting of iron on the bed charge before the coal was all burnt up, etc., but the results were not much better than before.

About this time I became discouraged, and my bank account was worse than discouraged. It was necessary to work all the harder in the blacksmith shop and earn money enough to pay off the molders. In fact, ten men working as hard as they knew how in the blacksmith and woodworking shops could only earn enough to keep three molders going. At this crisis a local hardware merchant, however, came forward and agreed to take 100 stoves at $15 each, and to pay $200 down in advance to bind the bargain.

A few days before this I had hired a tramp molder who wanted a lot of boot-jacks made for himself. These boot-jacks were used when he was on a tramp to pay for drinks, and I found out later that he or any other tramp did not have to be in motion to convert a boot-jack into drinks. While he was working on his jacks I gave him a few very small jobs, and by noticing his movements decided that he understood his business. I asked him about the trouble with our dull iron. He said that was an easy problem, all that was needed was plenty of blast and plenty of coal, and that he could produce any kind of hot iron or cold iron. I had a good No. 4 Sturtevant blower and plenty of coal. He agreed to take charge of the cupola for the next few heats, and we certainly learned something from that tramp molder. We were all satisfied that he would make a good hand in a foundry except for the fact that by this time he had a large stock of boot-jacks on hand, and it kept him busy most of the time in disposing of them and getting over the effects.

News travels fast in trampdom, and it was not long until the ancient order of tramps had spread the word all over the country that I would take care of them in good shape, and our demand for tramp molders was always more than supplied. During this period, however, I never turned the cold shoulder to any of them and learned some good points from every one.

With the help of the migratory tramps and the points I picked up from them, the order was filled and a few more sold; but my experience was so expensive that I could not afford to keep up the stove business. To add to my difficulty an eastern house shipped in stoves which they could deliver at $10 each, and they were better than any I could make. As a consequence I dropped the stove business along with my surplus cash.

Before I could do any more foundry business it was necessary to liven up the blacksmith business, machine work, etc., secure more work in that department, and make my bank account look a little better. At the same time I man-

aged to keep one man in the foundry, taking off a heat about once in ten days, and as a rule I acted the part of cupola tender and general helper. I was also able to do some plain molding and make a few cores. The tramps who dropped in occasionally would often leave partially finished molds when they found it necessary to dispose of a boot-jack, and the result was that I was compelled to finish up these molds to prevent their losing the sale of the boot-jack. My stock of boot-jacks was finally disposed of, the last one eloping with one of the tramp molders, and I made no effort to trace the guilty pair.

About this time I discovered that I could do my own molding better and cheaper than I could keep track of wandering molders. Nevertheless, the habitual tramp molders paid me regular visits, and always seemed glad to see me. As the established rule they would leave my shop with either 25 cents or some of my tools tucked away in some of their clothes. They always seemed to compliment me on my tools, saying that my hand forged slicks and trowels were much better than factory made tools.

It seemed as though they always had to have some kind of a tool as a card to prove that they belonged to the craft. Now the card has been substituted for tools, and just think what a great saving it is and how much more comfortable a molder can ride in a box car with a card in his pocket than he could with some long lifters or a rusty trowel or two. Half of the molders of the present day hardly seem to know what a lifter is and seem to be familiar with nothing but a shovel and possibly a rammer. These changes seem to be due to the introduction of machines into the bigger foundries; but for the people who object to hard work I would advise them to become molders and start a small shop of their own. According to the present theory, all that is needed is a card and a molding machine, but I will guarantee that as they proceed in the business they will learn something.

In all seriousness, however, any town of 10,000 people situated in the central west would be glad to donate a good location and probably give a bonus to someone to start a foundry in their region, and if anyone wants to lose money and get experience, it is a splendid chance. The writer has certainly paid well for his experience, and hopes in a later number to tell some of the pleasures which have been derived from the foundry business.

A LARGE CASTING.

The Westinghouse Machine Co. has recently completed a casting of a bed plate for a horizontal tandem, double acting, gas driven blowing engine which it is constructing. This bed plate consists of two castings, the combined weight being 162,000 pounds. The casting was made in two parts to facilitate handling in shipment and during the erection of the engine. Also for the purpose of avoiding danger from unknown strains in a very large casting, which might result if the bed were cast in one piece. We are indebted to Mr. W. A. Bole, manager of works, for the photographs and description of the work.

The Westinghouse Co.'s foundry has a capacity of melting and handling 200 tons of iron in the Trafford foundry for any given casting, and hence it was for no reason of foundry limitation that the casting was divided into two parts. It was considered, however, that it was better designed when divided and that it would facilitate handling both in the shop and during erection. As it was the pillow block section of the casting weighed 96,000 pounds and required a special heavy railroad car for its transportation owing to the fact that the side on which the shaft bearing is located is much heavier than the other and the casting itself was so wide that the center of gravity of the casting could not be located over the center of the car.

The two castings forming the bed are very securely fastened together by shrink links on the outer edges, as shown, and by a large number of substantial bolts passing through the hea-

vy flanges on the interior sides of the crank pit. In addition to this, an enormous steel bolt located directly above the shaft and running through the jaws of the main pillow block, extends back into and is keyed to the slide casting, and this, being located on the same side of the bed as the shaft and the slide portion 66,000 pounds. They were cast of air furnace iron showing a high tensile strength, and were very true indeed to pattern.

Fig. 1 shows the flask in which the pillow block portion of this bed was cast; the cope suspended above the flask with the lightening cores hanging in position ready to be lowered down for final closing. As will be noted, there is no brick used at all in the making of these molds, the ordinary

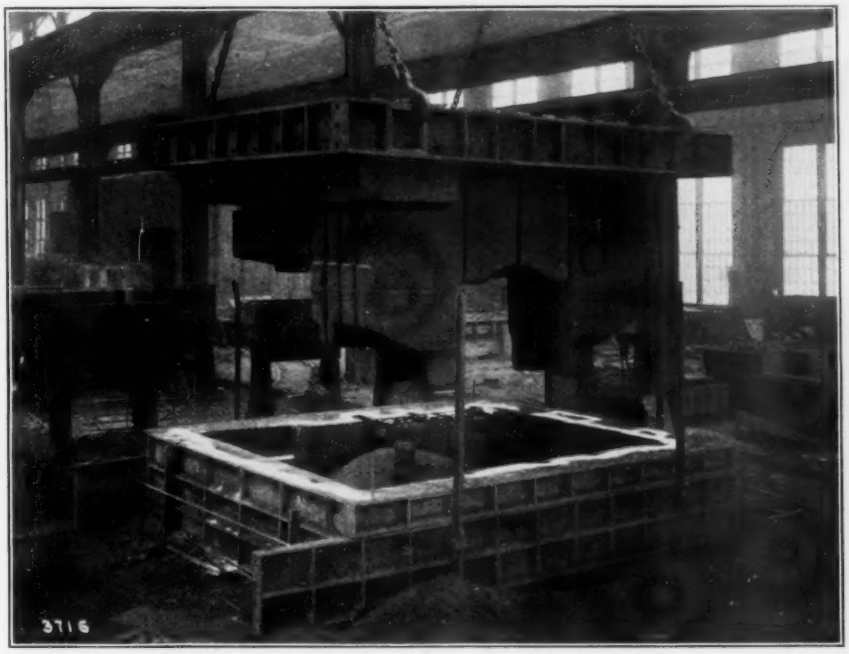


FIG. 1.—MOLD WITH COPE AND CORES SUSPENDED.

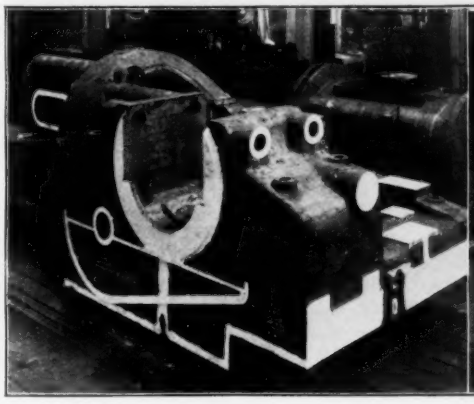


FIG. 3.—PILLOW BLOCK SIDE OF HEAVY CASTING.

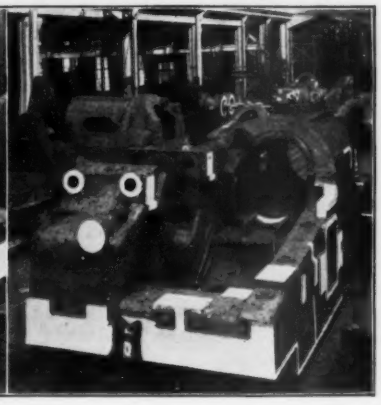


FIG. 4.—END VIEW OF CASTINGS.

thrust, the design is thought to be enormously strong.

The pillow block portion of this bed, as above stated, weighed 96,000 pounds,

heap sand of the floor being used for backing, and a fairly strong facing sand against the pattern, the mold being skin dried by the use of natural gas after being slicked and blackened.

The illustration shows the method of securing the cores to keep them from swaying, and shows how the long cores, which are upwards of 7 feet in length, are securely bolted together to prevent any displacement in lowering which might cause the cores to shift. The cores are drawn up against the cope by hollow bolts through the center of which the core gases are allowed to escape, and the cores are stiffened and steadied by the use of adjustable length chaplets, to give great strength and solidity.

As will be noted, the flask rig is of a substantial character, no wood whatever being used in its construction.

These castings were molded by the use of pneumatic rammers, and, owing to the excellent quality of the work done by these implements, the castings are remarkably free from any swells or blemishes which so often come from soft spots in a mold, produced by imperfect hand ramming.

It is to be regretted that the photographer failed to have a man standing near each of these castings while taking the photograph, so that the observer might judge of the comparative size; perhaps the only dimension which can be used as a measure is the distance between the slots in the surface plates on which the casting rests in the view taken in the shop. These slots are located 12 inches from center to center.

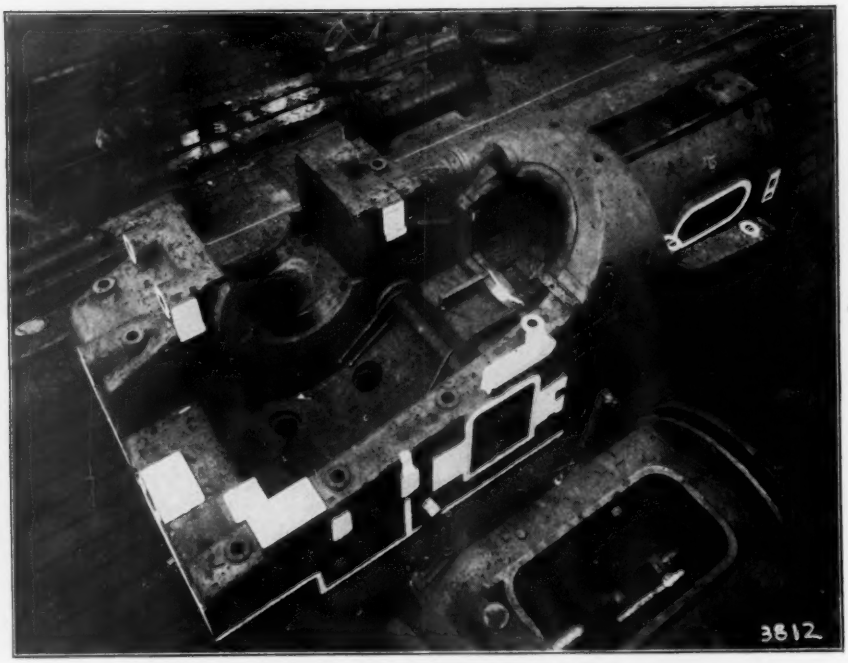


FIG. 2.—GENERAL VIEW OF TWO CASTINGS.

THE EFFECT OF A LITTLE PIECE WORK ON A JOBBING FOUNDRY.

BY OSCAR W. BURNS.

In a little foundry where the work was mostly of a strictly jobbing nature a contract was taken for several thousand castings with the chance of getting additional orders if this one was rushed out in good shape.

They were simple castings with only four small dry sand cores in them. There was not any machine work to be done on them when they came from the foundry. They were a sort of clamp that the gas companies used to

help hold the joints of their high pressure pipes tight. After being cleaned they were broken apart where a couple of flat cores had been set.

Two of these clamps went on each joint of pipe and were drawn together with bolts. The holes for these bolts were formed by the pattern in the green sand. The holes for holding the two parts of the clamp together were formed with dry sand cores.

As these castings were easy to make the work was given to the boys to make. In figuring on the price in the effort to get the work this had been counted on.

Before many of them had been made it was seen that the losses were very high considering the class of the work. It was mostly in the holes or in the splitting cores. As these castings did not have to be machined in any way, and the form and dimensions were such that they were much stronger than was needed for any strain that could be put upon them with the bolts any kind of iron could be used that could be run into the molds. The result was that the most of the iron was too hard to be readily drilled, and so, if any of the holes were bad it was cheaper to remelt the casting than to try to drill out the hole.

These clamps were intended to go onto eight and ten-inch pipe. They were made about an eighth of an inch larger at the smallest side than the size of the pipe they were for, and any swell or roughness in the large hole that would prevent the ears from coming together made it necessary to throw them out. The castings weighed from forty to fifty pounds each, and were molded two in a flask.

Five boys were on this work, and it often happened that a third of the castings had to be thrown out. The patterns for a size were all alike, and of course every boy who was making that size was very sure that the bad castings were not of his molding. To settle this question each boy was given a letted. This letter was put onto his patterns and it was thought that in this way it could be seen who made the bad castings and how each one was made, whether good or bad.

It did help some but it was surprising how many castings had the letters slicked off, and on how many more the letters were so indistinct that they could not be told. The number of bad castings fell off somewhat, but so did the number of molds made per boy. The number of good castings remained about the same. More were wanted, and would have to be got out if this foundry was to have more of these orders.

The wages of the boys had been from fifteen to twenty cents an hour, and the oldest boys had been putting up ten flasks a day. The owner said that he would pay ten cents apiece for good castings, and that the bad ones would not be paid for. Some of the boys did not want to work that way, but were told that it was that or nothing, and they could see that there was very little other work of any kind to be done, so they all started in.

The number of bad castings was less at once, and the letters on the castings began to stand out nice and clear. At the beginning there had been some disputes as to who should have credit for some castings which lacked a sufficiently distinct letter and the boys were told that in such cases credit would not be given to anyone. That settled that point. The letter would be good even if the rest of the casting was not.

Things went along somewhat better for the owner with the boys working by the piece, but the boys did a lot of growling about the price they were getting. One day a big young boy dropped in and asked the owner if he could have work in the foundry. He said he could mold a little. The owner told him about the clamp job, and the price he paid for it, and said he could go to work on that. The boy stood around for a while and then came and began to ask questons.

"How long is the job likely to last?"

He was told of the orders on hand and those that could be gotten.

"How many could they use in a day?"

He was told that the more they made the better the company getting them was pleased, and the more orders they would get. Foundries in other places were also making them but there was less hauling getting them from this one.

"How much would they let him make a day without cutting his rate?"

He was told that the rate would remain the same as long as there were any of the castings to be made.

"How many flasks and how much sand could he have each day?"

He was assured that he would not be held back for either, and that he should have space enough even if they had to build an addition on to the foundry to give it to him. He started to work the next morning.

The first day he did as much as the best boy there and every casting was good, and before the week was out he was putting up fifteen flasks a day and it was a rare thing for him to lose a casting. The boys had begun to kick about having to help him lift off and on so much.

To look at this boy working he was the least hurried in the lot. He was never too busy to hear when another boy called for a lift, and his castings were the nicest ones made. Most of them could be picked out without looking at the letter. It was only necessary to pick out the best ones in the heat and the chances were good that he had made them.

The other boys began to speed up some, but none of them caught up to him, and some of them found the extra pace very trying, and began to twit him about "killing himself," and "killing the job," and "having a strong body and a weak mind," and in return he limbered up a bit and made twenty flasks a day for a few days, just to show them what he could do, if he really wished to exert himself. He also informed them that he thought he could make at least thirty molds a day without hurting himself, and would do it if they did not let him alone.

The boys thought it wise not to tempt him too far and let him alone, and he worked along averaging thirty good castings a day while the job lasted, and then he quit and went away because the regular molder's wages was not big enough to suit him.

In the little jobbing foundry the work is sometimes very scarce and at other times there is more than enough. During one of these latter times a man was put to work on some bridge castings. There was a lot of them to do. About half of them were bad in one way or another. Some would be sound but warped so that they could not be used, while some were straight enough but were bad from other causes. The owner was in despair. At this rate he would not come out even. The man had been making ten molds with one casting in each mold, and he had been getting from two to eight bad castings. As soon as he began making them on piece work he quit having any bad ones and made from twelve to fifteen molds a day. After he had kept it up long enough to show that it was not accidental the owner discharged him. He was also told that a man who did that kind of a thing was not honest, and was not wanted at any price.

OSCAR W. BURNS.

OPEN-HEARTH STEEL CASTING.

Manipulation of heats in Acid Practice.

BY W. M. CARR.

Given an acid lined hearth and stock for melting purposes, the next step will be to consider some of the changes that take place in the conversion of the materials charged into steel. As has been mentioned the only elements, that are confined within stated limits, are the sulphur and phosphorus. Considerable latitude remains in making up the charge in regard to the available silicon, carbon and manganese carried in by stock. Assuming the stock to be made up of pig-iron, billets, blooms, plate-clippings, axle-butts, defective steel-castings, shop scrap or wasters in varying proportions, a charge of 24,000 pounds will be studied because the diagram herewith shown were plotted on a heat of that size.

The proportions and changes would be relatively the same in a 20-ton heat. The charge will be as follows:—

Acid pig iron	= 3,600	15	per cent
Mixed scrap	= 20,400	85	" "
Lbs.	24,000	100	" "

Average Composition.

C	.90	per cent
Mn	.47	" "
Si	.40	" "
S	.024	" "
P	.028	" "

The order of charging will be as follows:—

First.—Two-thirds of pig iron.
Second.—Lightest sections of scrap.
Third.—Heaviest sections of scrap.
Fourth.—One-third or remainder of pig iron.

The object in charging the pig iron in two portions with the larger on the bottom is to protect it from scorification caused by the oxide of iron always formed in the melting of the scrap which oxidizes at a faster rate than the pig iron. The portion of pig iron on top is the first to melt and in dripping over the scrap lowers the melting point of the latter and in a measure protects it from undue burning or oxidization until the whole mass sinks below the slag formed during the exposure of stock to the flame action.

The length of time occupied in charging varies as to the size of the pieces of scrap charged and the room it offers to follow with the rest of the stock.

Occasionally there may be some little time elapse before the bulky stock may have partly melted and subsided before the charge can be completed. Usually the length of time consumed in charging is about one to 1½ hours.

The charging of stock being completed the history of the heat is divided into two stages: first the melting; second, the complete fusion and conversion of the materials. During the first period little or no change takes place in the composition. The main function being the transmission of the solid stock to the liquid form and with it the formation of the slag which is to play an important part in the subsequent conversion of the stock to steel.

The length of time in liquefying the stock is normally from 2 to 2½ hours and during that time the temperature of the furnace is gradually increasing owing to the method of regeneration already explained.

It is certain that some changes occur as soon as the stock begins to melt and the slag begins to form. Perhaps the most pronounced change takes place by flame action on the exposed stock, it being strongly oxidizing; but not until the charge becomes entirely fused or liquid does the active part of conversion begin.

With complete liquation of charge the flame simply becomes a vehicle of heat and under the practiced eye of the melter the thermal conditions are so maintained that the temperature of the bath is gradually increased as the conversion progresses. It is necessary that the temperature of bath be gradually increased because of the influence of carbon. In general terms the fusing point of iron or steel depends upon the amount of that element. The higher percentage fusing at a lower point thermometrically than the lower amounts.

Glancing at the diagram the carbon will be seen as gradually increasing as the conversion progresses.

Without a corresponding increase in temperature the bath of metal would become pasty; and with the bath in that condition there would be losses.

In order to induce liquation at the first stage of conversion it is necessary to introduce carbon that being furnished by the pig iron of the charge. Fluidity and proper thermal conditions succeeding are then easily attained.

Assuming the stock to be melted and having passed from *direct* flame action below a covering of slag the functions of that will next be considered. The existence of the slag is derived from sand carried in mechanically by the stock, the oxidization of the silicon contained in the pig-iron and scrap to silica, the oxidization of the manganese brought in by them to manganous oxide, some scorification of hearth and the oxidization of iron to ferrous oxide.

Normally the slag is automatically formed, in regard to composition,

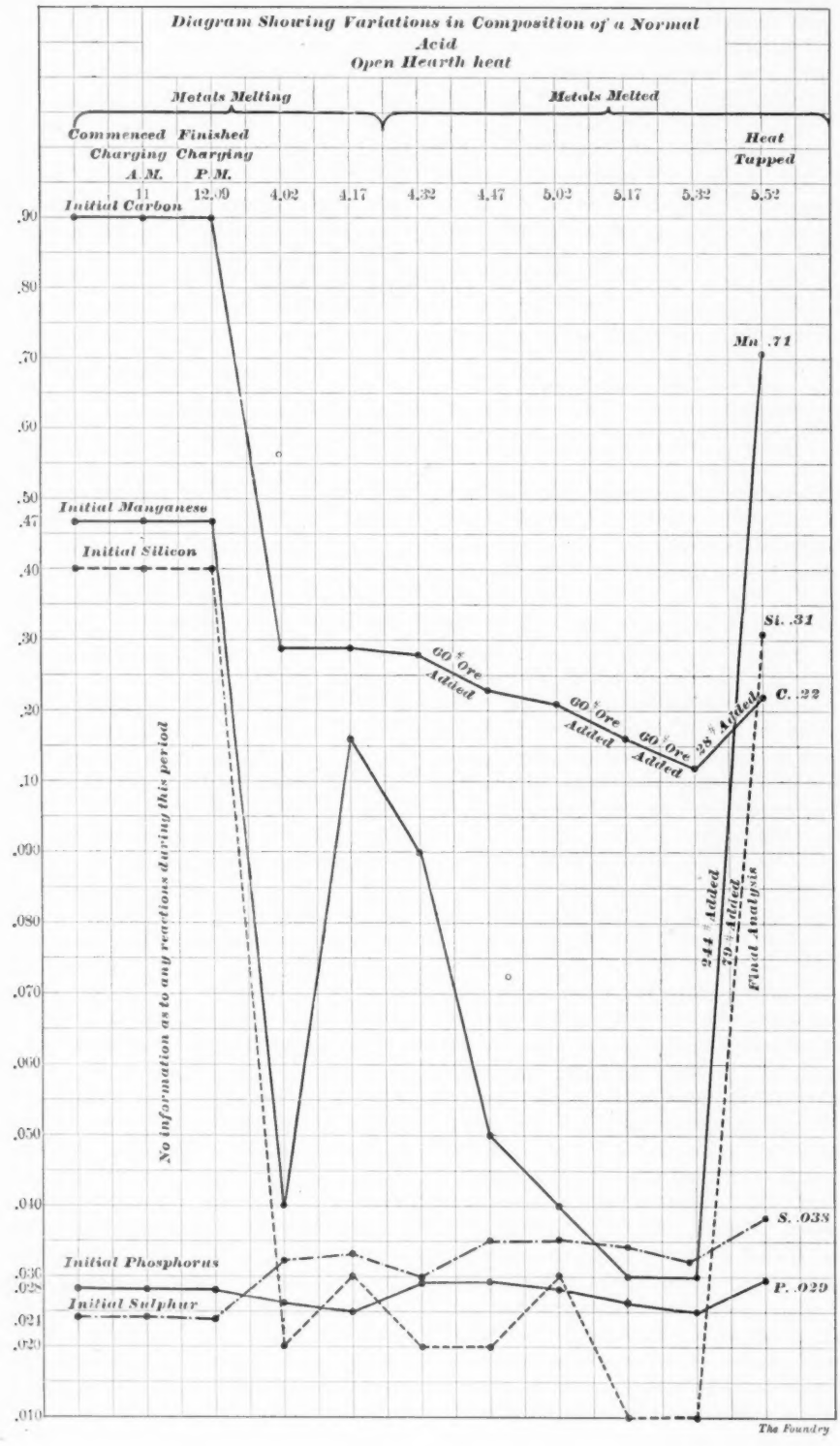


Diagram Showing Variations in Composition of a Normal Acid Open Hearth heat
Metals Melting
Metals Melted
Commenced Charging A.M.
Finished Charging P.M.
Heat Tapped
11
12.09
4.02
4.17
4.32
4.47
5.02
5.17
5.32
5.52
Initial Carbon
Initial Manganese
Initial Silicon
Initial Phosphorus
Initial Sulphur
Mn .71
Si. .31
C. .22
S. .038
P. .029
90 % Ore Added
90 % Ore Added
90 % Ore 28 # Added
No information as to any reactions during this period
24 # Added
29 # Added
Final Analysis
The Foundry

throughout the progress of the heat.

Should there be an excess of FeO due to low silicon pig-iron, there would be an excessive cutting of hearth and it might be necessary to add sand to furnish the needed SiO_2 to form the adjustment of proper slag composition.

Approximately a normal slag in an acid heat consists of nearly equal parts SiO_2 acid and FeO + MnO (bases) and this composition will exist throughout the heat with a gradual increase in volume resulting from the continued oxidization of silicon and manganese and by the additions of iron-ore.

The oxidization of the carbon causes a lively bubbling in the bath by the liberation of CO as a result of the exchange between the FeO of the slag and the oxygen furnished by iron-ore additions, which may be expressed as follows:—

$C + O = CO$ or $C + FeO = Fe + CO$.

The metallic iron reduced from the slag's FeO and that brought in by the iron ore (Fe_2O_3) is immediately absorbed by the bath. Were there no additions of ore the slag would become thick and pasty owing to the decrease of the base FeO.

Test samples are taken regularly after melting, the fractures of which indicate the amount of carbon in them giving guidance to the melter as to the necessary additions of ore.

In acid practice only the carbon is considered in preliminary tests but for detailed information they may be examined for the usual elements. When in the judgment of the melter the bath needs no more iron ore and the decreasing carbon has reached a predetermined point (which can be accurately estimated by the practiced eye) preparations are then made to finish the heat.

The thermal conditions being satisfactory, and the slag normal, deoxidizers and recarburizers in the shape of ferro-silicon and ferro-manganese are then added and the heat of finished steel is ready to tap or draw off into a hot ladle.

Details of Re-Carbonizing.

Assuming that the chemical composition of the metal going into castings shall be as follows:

C	.25	per cent
Si	.300	" "
S	.040	or less
P	.040	" "
Mn	.75	" "

which may be considered as representative of regular practice on medium hard cast-steel. Taking as a basis 24,000 pounds of metal charged the weights of ferro-silicon and ferro-manganese 792 and 305 pounds respectively, from them there will be furnished silicon, manganese and carbon plus those several elements contained in the bath at the time of final additions. According to these analyses the available elements will be first, silicon from the FeSi with 10 per cent Si,

$792 \times .10 = 79.2$ lbs. Si;

second, manganese from the FeMn with 80 per cent Mn,

$305 \times .80 = 244$ lbs. Mn;

third, carbon from both the FeSi and FeMn.

$$792 \times .015 = 11.88$$
$$305 \times .055 = 16.77$$
$$28.65 \text{ lbs. C}$$

Taking into account the residual silicon, manganese and carbon of the bath, and adding to them those furnished by the FeSi and FeMn there will be,

	Lbs.	
Si = .0001×24,000 + 79.2 =	81.6	total available
Mn = .0003×24,000 + 244.0 =	251.2	" "
C = .0012×24,000 + 28.7 =	57.5	" "

With the pounds of the several elements divided by the weight of the charge there will be found the approximate analysis of the finished product,

$100 \times 81.6 \div 24{,}000 = .34$ per cent Si
$100 \times 251.2 \div 24{,}000 = 1.05$ per cent Mn
$100 \times 57.5 \div 24{,}000 = .24$ per cent C

or calculating another way the approximate composition can be determined in finished product using the same quantities of values in terms of available silicon, manganese and carbon:—

$$\frac{100 \times 79.2}{24{,}000} + \text{Residual } .01 = .34 \text{ per cent Si}$$

$$\frac{100 \times 244}{24{,}000} + .03 = 1.05 \text{ per cent Mn}$$

$$\frac{100 \times 28.65}{24{,}000} + .12 = .24 \text{ per cent C}$$

(In making the foregoing computations the amounts of sulphur and phos-

phorus have been ignored. With a slag highly charged with silica no absorption of these takes place, and the amount of either carried in by the melting stock nearly equals the finished product in regard to their content. Usually there are slight gains. The sulphur increases because of flame contamination and a loss of metallic iron by oxidization. Phosphorus also increases slightly through the latter cause. Both may be slightly augmented by movements from the deoxidizers.)

The chemical composition as shown in the foregoing figures will differ from that shown by the ultimate analysis of a sample taken when the steel is going into the molds. Comparing the approximate and ultimate figures we find:

	Approximate analysis.	Ultimate analysis.
C	.24 per cent	.22 per cent
Mn	1.05 " "	.71 " "
Si	.34 " "	.31 " "

The main difference is between the manganese added and that found, the cause of which will be understood in the explanation of the purpose in using the deoxidizing agents FeSi and FeMn During the second stage of the conversion the bath of molten metal carried variable quantities of dissolved ferrous oxide (FeO) and with that substance there was a vigorous chemical action between the carbon and the oxygen of the FeO producing copious bubbles, throughout the bath, of the gas CO. So long as the bath remained liquid this chemical action would go on, charging it with that gaseous body. Were the metal in that condition to be poured into castings they would be found to be unsound or honey-combed with blow holes.

Since solidity of product is one of the objects sought in the physical properties, recourse must be had to some agent or agents that will remove the gas forming action in the bath of metal before it can be drawn off. The agents must possess greater affinity for the oxygen of the dissolved FeO than the carbon in intimate association with it. Practical experience has shown that manganese and silicon accomplish the purpose and those elements are commercially available in the alloys, FeMn and FeSi. Hence their designation as deoxidizers. The functions may be expressed as follows:

(1) $FeO + Mn = Fe + MnO$

(2) $2FeO + Si = Fe_2 + SiO_2$

In the interchange between the C and the FeO we have a gas impregnating the bath. In the interchange, as shown in the above equations, we have a solid or an easily fusible slag formed by the SiO_2 and the MnO, which being lighter than the molten metal quickly floats to the surface of the bath. Thus with normal conditions the metal will cease bubbling and pour quiet or "dead" and tend to make solid castings.

The amounts of silicon and manganese in the finished metal will in the main depend upon the condition of the bath at the time the deoxidizers are added and the differences in analyses between the approximate and ultimate figures may be taken to represent the amount consumed in "washing" the bath of metal.

The usual practice in adding the deoxidizers is as follows: The carbon having dropped to say .10 to .12 per cent the dose of FeSi, broken into short pigs, is placed on the breast of the furnace in order to heat it up before pushing it into the bath. After an elapse of about eight minutes the whole is pushed into the bath. Allowing a little time to pass during which the FeSi is melting and dissolving. To insure a complete distribution the bath is agitated with bars of iron. Ten minutes after the FeSi is added the metal is ready to tap, but before doing so, the dose of FeMn is thrown in and then the tapping may take place. It is sometimes the practice to put part of the FeMn into the furnace and part into the ladle, the latter being done while the steel is flowing into it.

In an acid heat the losses of silicon in the act of deoxidizing are not great but with the manganese for the same purpose, considerable is consumed, being greater when entirely added to the furnace than when divided between the furnace and ladle. For that reason it is necessary to make allowances for such losses when calcu-

lating the necessary dose. Further, the losses are greater using oil for fuel than with gas. The latter flame being "soft" and the former sharp. An oil flame may be likened to a blow-pipe and its effect always strongly oxidizing.

As already shown silicon will reduce the FeO but the reduction is not always complete and what may escape the silicon may further unite with manganese. Hence the reason for simultaneously using two powerful and active reducing agents. The influence of the two agents remaining in the finished steel after their reducing function will be considered later.

The yield of metal after conversion against the weight charged is a variable one and depends upon the character of stock and manipulation. If the stock, other than the pig iron, should be of light, thin sections, there will be a heavy melting loss due to excessive burning or oxidizing. If the flame should be very sharp during the melting period the same condition will arise. The melting losses are also heavier on oil fuel than on gas for the reason as stated. Not only will the conditions (when abnormal) result in heavy melting losses but the effect will be seen in certain physical properties of the product. That is to say "over-oxidization" from any cause is bad practice; yet even with a greater tendency towards "over-oxidization" following the use of oil, the condition is still subject to control. To express the losses in figures to represent the difference between metal charged and that yielded is not so easy but it may be found to be about 5 per cent.

The principal points about the manipulation of an acid heat may be given as follows:

1st. To charge enough pig iron so that there will be a high enough initial carbon to ensure an easily maintained fluidity of bath. A low percentage of pig iron will mean a rapid heat but at the sacrifice of quality and a very high flame temperature. The less carbon charged the greater the chances of over-oxidization.

2nd. Charge as heavy sections of scrap as possible and protect it as far as possible from burning with a covering of pig iron.

3rd. Watch flame conditions to guard against undue burning of stock. This point calls for a high degree of skill to maintain flame conditions and yet reach the thermal ranges necessary to melt the stock.

4th. Be judicious in oreing heats. Too much ore is harmful.

5th. Aim for uniformity in product in a given class of work.

6th. Over anxiety for tonnage will make the scrap pile grow.

TRADE PUBLICATIONS.

Geo. G. Blackwell, Sons & Co., Ltd., of Liverpool, England, are sending out a very neat diary. It is composed of six little books, each 2¾ by 4⅛ inches, ruled for two months' diary, and in the back of each book there is a calendar for 1906, and on the front and back covers some advertising matter setting forth the product of Geo. G. Blackwell, Sons & Co. For carrying one of the books in the pocket, a very neat little pocket book is provided, with an elastic band for holding the book in place. The pocket book has places for cards, stamps, etc.

The J. W. Paxson Co. sent out, for a Christmas gift, to something over a thousand of their patrons, a pocket case, containing a pocket knife tool kit, including several very useful tools. The kit must be considered of value, for somebody appropriated the editor's before it reached him, and hence, it is impossible to describe it in detail, but we believe that such souvenirs are appreciated more than many of the cards, calendars, etc., which have been sent out in the past.

The Roessler & Hasslacher Chemical Co., manufacturer of special alloys, of New York City, is issuing a wall calendar in the center of which there is a picture of Patzcuaro Lake, Mexico. Above and on the sides of the picture is an advertisement of the company and below a calendar by months, the the figures being ⅝ of an inch high so that they can be seen some distance.

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PRACTICAL ALLOYING, VII.

White Metals.

BY JOHN F. BUCHANAN.

The copper alloys bulk so largely in the manufacturing world that is hard to get away from them. Taking the melting temperature of alloys as a means of division we have now to consider the more fusible but none the less serviceable alloys generally classed as "white metals." Whereas most of the structural alloys, having a copper basis, melt in the neighborhood of 1,000° Cent., the white metals and alloys require on an average less than half that temperature for their fusion. Outside of the ornamental white alloys—German silver, mock platinum, aluminum silver, and the like—and the white antifriction alloys, there remains an important series of white colored metals having special casting qualities and high mechanical values. Such alloys as type metal, Brittannia metal, fusible metal, and solder do not belong properly to the general foundry practice—the best castings in these easily crystallized metals are obtained from chills, but owing to their fluidity, giving sharp impressions, and the expansion due to the presence of antimony or bismuth, they are eminently suited for mixing into pattern metals for sand molding as well.

The great advantages of metal patterns as against wooden ones are so great that their use is warranted for comparatively small lots of castings. Cast iron as a pattern metal is open to objection because of its brittle nature and its tendency to rust; nevertheless it may be freely used provided thin sections are avoided.

For small solid patterns (a) zinc, tin and (b) lead antimony mixtures are favored. Usual proportions run (a) zinc 30 to 50 parts, tin 50 to 70 parts. (b) Lead 78 to 87 parts, antimony 13 to 22 parts.

Solders, or lead-tin alloys are largely used for mounted pieces on molding machines; a good mix in this class is lead 50 parts, tin 50 parts. These metals have the advantage of being cheap, but if the initial expense of getting up patterns for continuous use is not grudged, some of the tin-antimony alloys, or better still, the hardened aluminum alloys will give better results as regards stiffness, wear, and conformity to design, besides being free from objection on the scores of shrinkage and clogging of the sand.

TABLE I.

Pattern Metals.

	Tin	Zinc	Antimony	Lead	Copper	Bismuth	Aluminum
1.	45	45	..	10	..	...	.
2.	17.5	..	..	75	..	7.5	.
3.	....	90	5	..	..	...	5
4.	3	85	..	..	10	...	2
5.	....	90	..	..	4	...	6
6.	80	..	20	..	..	...	.
7.	65	30	..	..	..	5	.
8.	16	12	12	64	..	...	.
9.	8	87	5	..	..	...	.

The properties necessary for good pattern metals are fluidity, low contraction, rigidity and strength. For ornamental castings or chased patterns a fluid alloy having the important property of expanding on cooling would give the best results. Nos. 2, 3, 6, 7 and 8 would answer. No. 6 is a somewhat expensive metal but it is well suited for high class standard patterns. No. 1 will answer for castings requiring a certain malleability. No. 5 will stand a great deal of knocking about, as in wrapping pattern out of the mold. No. 4 is a splendid casting alloy but the contraction must be taken into consideration in making duplicates. The pro-

portions in the above table need not be adhered to so strictly as would be the case with alloys required to undergo physical tests. Many modifications may be suggested by experience and the different requirements of the castings or patterns produced.

Aluminum has had a great vogue, recently as a pattern metal and it has much to recommend it. Very serviceable, accurate and conveniently handled patterns, which are easily finished, result from the light aluminum alloys generally. Zinc aluminum is a favorite combination nowadays because of the cheapness and strength of the product. An alloy of Al 75 parts, Zn 25 parts shows tenacity equal to 35,000 lbs. per square inch and the cost pro rata is much below the ordinary brass or white metal mixtures.

Alloys of aluminum and tin are somewhat brittle and unstable, but the introduction of tin in Al + Zu alloys reduces the shrinkage and increases the resistance to corrosion.

Copper up to ten per cent makes a convenient hardening agent for aluminum, but owing to the known tendency of the alloy to segregate on cooling, it is not advisable to introduce copper unless in conjunction with some other metal, as zinc, antimony, nickel, or tin. Some very useful alloys in this class are obtained by adding from 3 to 10 per cent standard German silver (melted) to the aluminum in the crucible. The 3 per cent alloy, first described by Dr. Richards, contains approximately ½ per cent each of nickel and zinc and 2 per cent copper. It gives a tensile strength in castings of 22,000 pounds, per square inch, with 3 to 5 per cent elongation, and has a fine white color.

Strong, light metals are in constant demand and other hardeners are being increasingly employed in the production of aluminum alloys and castings. Tungsten, chromium, titanium, silver, magnesium, and manganese have been used with good effects, but the alloys derived from any one of these metals and aluminum are all in the way of being specialties. For the most part such elements are either so expensive or so refractory as to be outside the range of practical foundry operations. The new alloy "Meteorite" (= Al + P) is easily produced by pulverizing the requisite quantity (4 to 6 per cent) of phosphor copper and adding to the molten aluminum. Similarly, manganese may be conveniently introduced in aluminum-copper alloys by using the commercial cupro-manganese, (30 per cent Mn).

TABLE II.

LIGHT ALUMINUM ALLOYS

	Aluminum	Zinc	Copper	Phos. Tin	Antimony	Cupro-Manganese.
1.	90	8	1	....	1	...
2.	96	...	2.5	....	1.5	...
3.	90	2.5	....	....	...	7.5
4.	84	12	4	....	...	...
5.	84	12	2.75	1.25	...	...
6.	80	15	....	....	...	5
7.	77	17	6	....	...	...
8.	75	23	2	....	...	...
9.	75	23	....	2	...	...
10.	72	25	2	1	...	...
11.	*67	33	....	....	...	...

The soldering of aluminum and its alloys still presents some difficulty. Hirons recommends that a deposit of copper be made upon the surfaces to be united prior to "tinning" and joining them together. Dr. Richards advocates the alloy invented by his father, viz:—Aluminum 1 part; phos-tin 1 part; zinc, 11 parts; tin, 29 parts. Numerous patent aluminum solders and fluxes are on the market, but it must be acknowledged that cleanliness and the prevention of oxidation by some such protective coating as that recommended by Hirons, or by the intervention of some reagent at the critical temperature, does more to ensure a satisfactory joint than any supposed virtue in the solder applied. Good results have been obtained with ordinary "fine" solder, and bad results may be had with any of the patent solders. It is a question of mechanical skill.

WHITE BRASS.

A large number of white alloys of

*The cheapest of all the light aluminum alloys, sometimes called the Sibley casting alloy. Specific gravity, 3.8. Tenacity 24,000 pounds in sand castings, close-grained but brittle like cast iron.

different grades as to color and hardness are used for casting small busts, figures, and ornaments in chills and in sand molds. Those alloys are principally used in the manufacture of cheap art bronzes and novelties which are lacquered. The workers employed in casting statuettes in chills acquire great dexterity in handling the latter. As soon as the cast is made and the desired thickness of metal is set (sometimes a mere skin of metal), they upend the mold and drain out the liquid alloy remaining in the center. This leaves a thin hollow casting with the outline of the bust, figure or design in perfectly regular proportions.

Sorel's alloys containing iron are also adapted for casting by this method. For producing zinc-copper alloys containing iron, two good plans may be followed: first, melt equal quantities of zinc and ferro-zinc together and add from 1 to 10 per cent of molten copper; or, second, melt 15 to 20 per cent delta metal and make up by adding plain zinc. Most of the white brasses comprised in the range of copper 20 to 45 and zinc 45 to 80 are appreciably improved by a further alloy of aluminum 2 to 5 per cent. The metal exhibits a higher degree of homogeneity and it is more durable and less liable to corrosion. Some typical white brass mixtures are given in table III.

TABLE III.

White Brass.

	Zinc	Copper	Tin	Aluminum	Lead
1.	66	33	..	.	...
2.	57	43	..	.	...
3.	56	36	6	2	...
4.	68	24	6	2	...
5.	80	20	..	.	...
6.	91	8	..	.	1
7.	90	3.5	3	.	3.5
8.	88	10	1	1	...
9.	80	4	16	.	...
10.	74	6	20	.	...
11.	28	57	15	.	...
12.	50	40	5	5	...

Nos. 1 and 5 are hard but easily worked. Nos. 2, 8 and 12 are somewhat malleable and can be pressed. No. 11 makes a good white brazing solder. Nos. 3, 4, 6 and 8 are excellent alloys for chill castings. Nos. 9 and 10 are well suited for patterns provided the usual allowance is made for shrinkage. No. 7 is a cheap mixture for ornamental castings.

A metal having a lustre equal to the best German silver but without nickel consists of copper 50 parts, cupromanganese (30 per cent Mn) 40 parts, zinc 14 parts, aluminum 2 parts.

Some Special Mixtures.

Plastic Metal	Tin	Antimony	Lead	Copper	Bismuth
1.	70.	15	10.5	4.25	.25
2.	80.	..	12	8	.5
Metallic Packing	**Tin**	**Antimony**	**Lead**	**Copper**	**Bismuth**
1.	42	17	38	3	...
2.	36	8	56	....	...

Bell Metal No. 1.

Tin 19. Nickel 80. Platinum 1.

Bell Metal No. 2.

Tin 17. Nickel 82. Aluminum 1.

White Bronze No. 1.

Copper 68. Zinc 21. Nickel 9.
Tin 1. Bismuth .5. Aluminum .5

White Bronze No. 2.

Copper 40. Ferro-manganese 60.

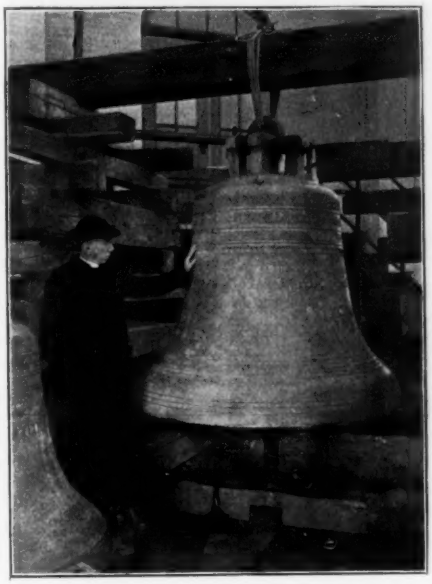
THE BELLS OF THE DENVER CATHEDRAL.

BY DEAN HART.

It is almost two years since one of our citizens, Mr. George C. Schleier, commissioned me to get for our new cathedral the best peal of bells I could. I felt this was a weighty responsibility, for to inflict upon a city a heavy peal of unmusical bells would bring unremitting execration on my head, especially from those who lived in their neighborhood; and they would prove from generation to generation a blatant irritant.

In the death of the Rev. Reginald Haweis I lost a friend who was an authority on bells, and whom I always intended to consult when the occasion required. I therefore wrote to one of my old friends, Canon T. Teignmouth Shore, to find in the Athenaeum Club, which is the rendezvous for literary and other celebrities in London, some other person whose reputation for bell

lore had become prominent since I left England. He answered my letter from Homburg, saying he would willingly put me into the communication I desired on his return to town, but they were all being charmed by the musical quality of a new peal of bells in the church at that celebrated watering place, whose founders were Petit, Edelbrock Brothers, Gescher, Westphalia; I wrote to them and they sent me a quantity of literature, the perusal of which convinced me that they were au fait in all the intricacies and delicacies of bell-founding; their firm had been established 400 years, and not a few of the most celebrated peals in central Europe were of their casting. What astonished me was, that Sir John Stainer, when he was determining from whom to order the new peal of bells



DEAN HART AND ONE OF THE DENVER BELLS.

for St. Paul's, appears never to have heard of them. This curious fact led me to much further correspondence, and I requested Mr. Peters, whose forbears lived in Germany, and who was then visiting his clan, to find out all he could on the spot. He very kindly made his way across country to Gescher and interviewed Herr Edelbrock, and inspected the foundry. He was satisfied that their published matter was not in any way exaggerated. I therefore ordered of them fifteen bells, by which we can have a peal of twelve, descending in the scale of E flat from F to B flat, and a peal of eight; adding three notes, A, E and F sharp, the leading note into the relative minor; by which combination it is possible to play a large number of hymn tunes.

The next consideration was, with what inscriptions and ornamentations the bells were to be furnished. As the new cathedral is of Gothic design, the lettering, etc., would have to be of that style; how befitting the ornamentation is, appears in the photographs. The following inscriptions were finally decided upon. There not being room for any couplets on the five smallest bells, on the face of each is printed:

First bell:
In the Name of,
Second Bell:
The Father,
Third bell:
And of the Son,
Fourth bell:
And of the Holy Ghost,
Fifth bell:
Amen.

The intention being to allow the bells to speak the various purposes of their use, each one of the lower ten bells declares one of the services.

Sixth bell:
To worship God, in Spirit, Truth and Fear,
With ringing peal we summon people here.

Seventh bell:
On this Cathedral Church may God's peace rest,
May all who come to worship here be blest.

Eighth bell:
We strike the Hours, which bear man to his doom,
And warn him to be ready for the tomb.

Ninth bell:
From tower high we sight the rising sun,

And in God's Name proclaim
the Day begun.

Tenth bell:

We bless in God's great Name
this Denver town,
Beseeching Him its life and work
to crown.

Eleventh bell:

We thrill with joyous peal the
wedding-day,
And on the happy pair God's
blessings pray.

Twelfth bell:

Our "Passing-bell" bids all the
neighbors pray,
That into God's care the soul
may pass away.

Thirteenth bell:

We flood the air with melodies
divine,
To fill men's hearts with thoughts
of Thee and Thine.

Fourteenth bell:

With note of prayer we close the
eventide,
"The darkness deepens, Lord
with us abide."

Fifteenth bell:

Our donor's praise we chime
with sweet accord;
"To him and his grant light
perpetual, Lord."

These couplets run around the top of the bells between two belts of ornamentation. On the face of the last three bells are the inscriptions:

Thirteenth bell:

H. Martyn Hart, D. D., Dean.

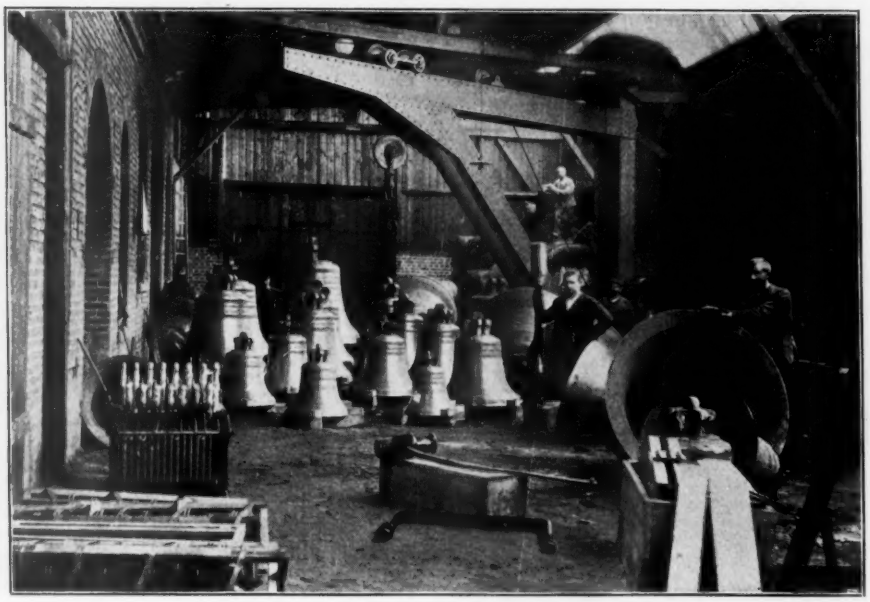
Fourteenth bell:

Charles Sanford Olmsted, D. D.,
Bishop.

Fifteenth bell:

This peal of fifteen bells was
presented to St. John's Cathedral, Denver, Colo., by George
C. Schleier. 1905.

For the time being the bells will be hung in a wooden structure, until they are removed to their permanent place in the central tower of the Cathedral.



THE BELLS IN THE FOUNDRY READY FOR SHIPMENT.

The bells are rung by having wire ropes attached to their clappers; these ropes pass over grooved wheels and so descend to the "Clavitur," which is seen standing in the left hand corner of Fig. 1. The white enameled handles of the iron levers are covered with sacking—to prevent their being damaged en route.

The ringer pulls these handles towards him, and thus sounds the bell.

The Casting of the Chimes.

The casting of a musical bell is one of the most delicate and scientific of

mechanical undertakings. Only long and capable experience can assure that the bell shall have one main note which is supported by only such other notes as shall be in harmony with it; this alone can produce a musical bell, and whenever there are notes present which have no harmonic relation to the main note, an inharmonious sound is the natural result. Anybody can cast bells, but it is only a few adepts who can produce with certainty bells of a musical character. Locomotive bells, for example, are used with the intention of frightening people, and they are effective.

The note of a bell is determined, of course, by its size and quantity of metal; and the contour of the bell decides the quality of the note. If the

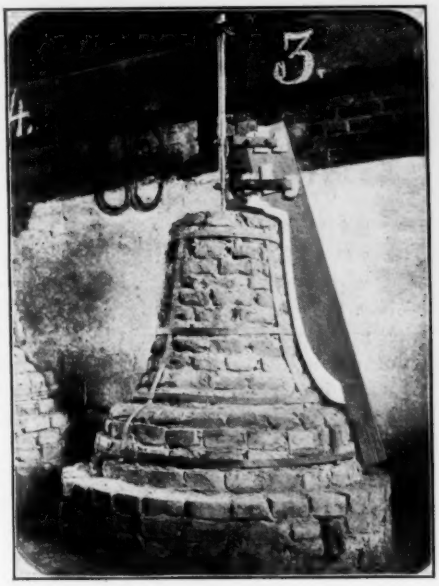


FIG. 1.—THE FIRST STAGE OF THE PROCESS.

bell be rapped at its top bend, it ought to give the octave above the chief or "consonant" note. Now a chord of perfect harmony— a "common chord"— is composed of the third, fifth and octave sounding together with the dominant note. If a bell is properly cast, on striking it at a place an eighth of its height from its brim, the third note, or tierce, ought to be heard and when struck at three-quarters of its height from its brim, that is, a quarter of its height from the shoulder or its uppermost bend, the quint, or fifth note, should be apparent. If either of these intervening notes are too sharp or too flat, the bell is a bad bell; and when such a bell comes from the casting, the founders attempt to tune it by chipping or filing away the metal from that part of the bell which gives off these notes to flatten them, and reducing the rim of the bell has the effect

FIG. 2.—INTERIOR SURFACE OF THE TENOR BELL.

of sharpening the note. It is hardly necessary to say that a bell so treated can never have the satisfactory sound which it would have had if it had left the mold in tune.

It is so seldom that a peal of bells is a "virgin" peal, that is, that every member of the peal is a "maiden," so perfectly in tune from the mold that it needs no tuning, that one of the bell authorities in England, in his correspondence with me, said that if the German makers succeeded in producing fifteen bells of this nature, they ought to have a world-wide reputation. We rejoice to say that our fifteen bells are as they left their molds, and are the admiration of all metal men; not an

unevenness of flaw appears on any of their surfaces, and they are in tune.

You can reach Gescher in a few hours from Antwerp, now the second port in the world, and one of the most interesting cities in Europe.

You go across Belgium to Wesel, on the Rhine, and then, after running a couple of hours into the heart of Westphalia, Gescher is reached; a little country town of some 8,000 inhabitants.

Herr Edelbrock is all politeness and hospitality; his pretty wife has a dejeuner ready for their guests; and then crossing the garden we are in the foun-

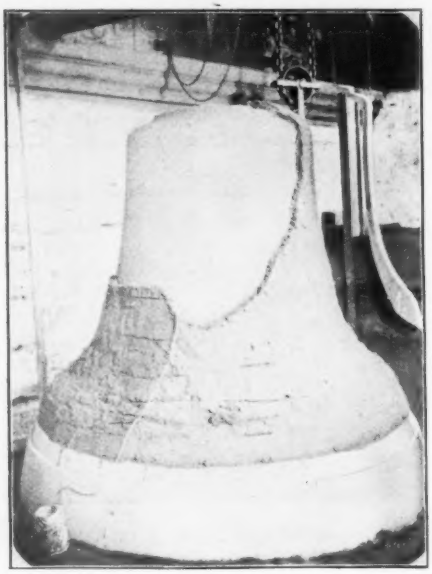


FIG. 3.—BUILDING UP ON MOLDS FOR CASTING.

dry. The fifteen splendid bells are all hung in a row, and workmen, stationed with hammers, ring them in all possible ways and we are thoroughly satisfied with their timbre and tune.

Herr Edelbrock shows me all the process of bell making, and supplies me with the photographs which are here reproduced. He is full of bell lore and speaks with an authority and certainty which indicates a thorough grasp of his subject, and so he ought, for he comes of generations of bell founders.

"Where is Herr Petit?" I asked. With a slight shrug of his shoulders he replied: "Oh, Herr Petit, he is already since 200 years dead."

They do not change the style of their firms readily in the old world.

The series of photographs of the founding of our bells will explain very clearly the methods used. An examination of these pictures shows that the work is conducted in a pit, which, when the molds are ready, is filled up to its top with sand, and the visitor, walking on an apparently sandy floor, would little suspect that beneath his feet was a series of bell molds ready to receive the molten metal.

Figure 1 shows the first stage of the process, which is the rough shape of the bell built up with brick; this "core" is hollow. Into it, through the hole visible near its bottom will, at a certain stage of the process, be introduced sticks of wood, which will be set on fire so as to heat the whole mold. A sloping profile of wood is fastened to the iron axis which occupies the central line of the mold. This wooden profile has a loose piece which can be seen in Figure III, hanging detached, and is marked 1; this represents a section of the metal of the bell; so that the profile, when 1 is attached, will, as it revolves upon the axis, shape the sand of the mold so as to form the interior contour of the bell, and upon its removal, by a similar revolution the exterior surface of the mold would be defined.

Sand finely ground and of a loamy nature is now applied to this brick foundation, and by causing the profile to pass round and round, Figure II is produced. This shows the interior surface of our tenor bell which speaks the German note B, which is our note B flat, and weighs 9,240 pounds, or nearly four and one-half tons.

The next question is to build up on this mold sufficient material to occupy the space into which the metal will be run to form the bell. This is managed as is shown in Figure III: the axis and the profile have been removed and a quantity of sand is laid on by hand and held in place by the winding string. When almost a sufficient thickness has

been applied, a final layer of fine sand, which can be accurately shaped by the profile, is added. The loose piece of the profile 1 is now removed, the axis restored to its place, and the profile have the bell, as it is to be in metal, modeled exactly in sand. When all this is dry and hard, four siftings of different finenesses of sand cover the whole surface, upon which is then

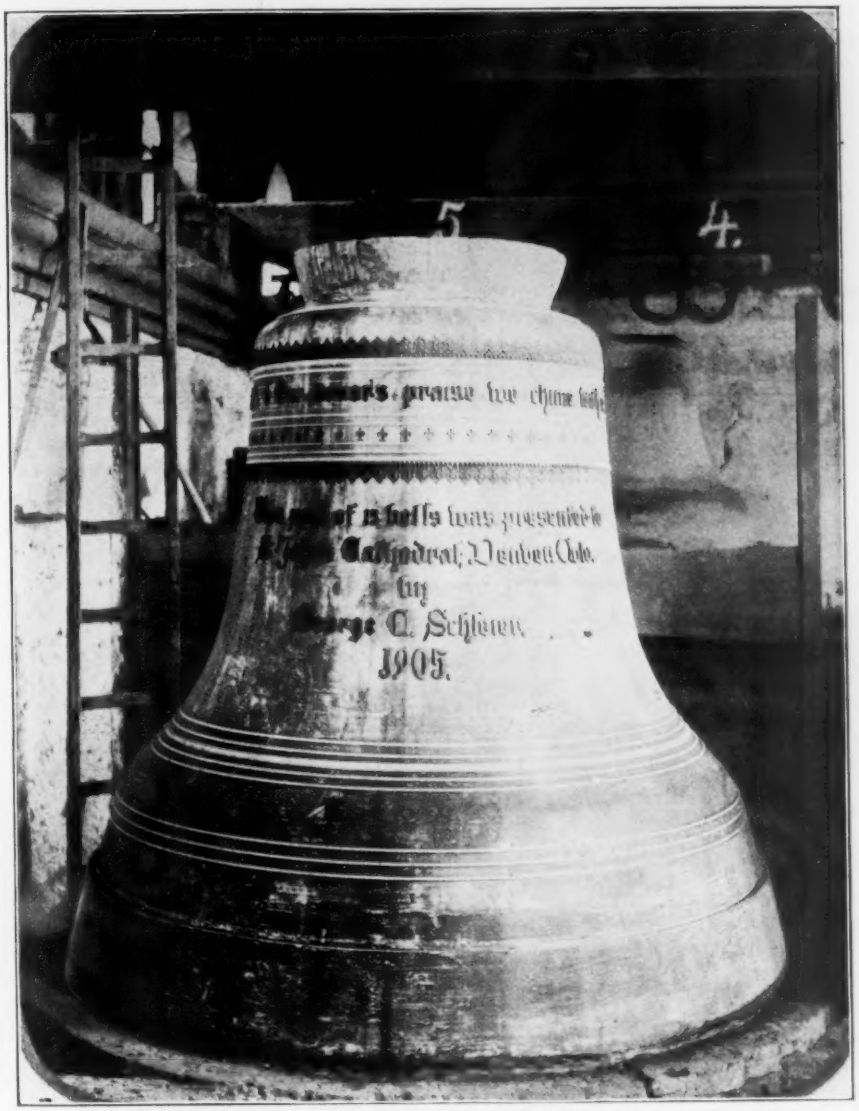


FIG. 4.—THE MOLD OF THE TENOR BELL.

caused to revolve until a perfectly smooth surface is secured. Now the delicate ornamentations and inscriptions in wax are placed in position, so that all the parts in relief on Figure IV, the ornamentations, the lettering and the bands are of wax. Thus we built up an exterior envelope of sand, the "cope" or "mantle," whose consistency is greatly increased by the addition of lime and by certain other devices. A fire of wood is now built in the interior of the core, through the opening at the bottom of the mold

exhibited in Figure I; by this heat the wax of the lettering, etc., is melted, and is absorbed by the surrounding sand, and a perfect impression of the surface of the bell is left on the interior of the external couche, the cope. being stripped off and the marks of the bands where the wax was are clearly visible. The uppermost part of the mold is now lowered to its place and firmly strapped together by iron hoops, as is shown in Figure VI. The metal

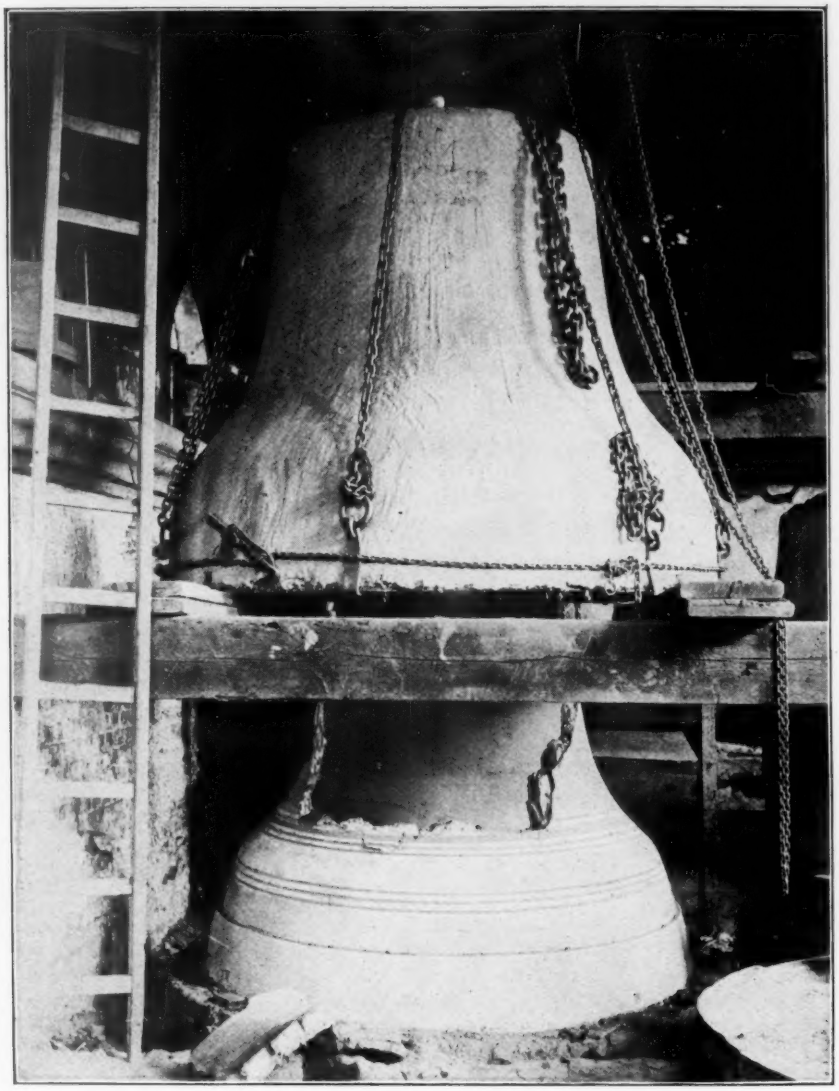


FIG. 5.—INTERIOR AND EXTERIOR MOLDS OF BELL.

This exterior shell of the mold of the bell is made so hard and strong that by means of chains and pulleys, as is exhibited in Figure 5, it can be lifted off, leaving the interior part of the mold standing, as it was in Figure II. The second layer the figure shows is loops, called the "canon," by which the bell will finally be fixed to its beam, are also made in wax and are adjusted to the top of the mold just underneath the figure 5, which is marked upon the beam directly over the mold.

When as many molds have been thus

prepared as is intended shall be cast at one time, the whole pit is filled with sand. Figure VII shows how the top of the bells, which of course cannot enjoy the pressure that the sand, filling the pit, supplies to the sides of the mold, are weighted with heavy iron weights and ingots of metal, as is seen in the foreground of the picture. In the crucible of the furnace is now fluxed the bell metal, which is an alloy of seventy-eight parts copper, and twenty-two of tin, with a certain quantity of manganese and phosphates which insure the amalgamation of the metals and bring to the surface any accidental impurities. The workmen are here standing ready to tap the furnace, Herr Edelbrock, in the center of the picture, determines the moment when the metal shall be discharged from the orifice immediately behind him near his left foot; by the opening close to his shoulder he inspects the molten metal and determines the fitting moment for the cast. The fluid metal is guided by the workmen along the channels cut in the sand, to the top of the various molds which is indicated by the weights, and so the bells are cast.

In mediaeval times bell-founders seemed to move about from place to place and execute their orders in the neighborhood of the church they were employed to provide with bells. Probably this was due to the difficulty of transporting such heavy weights along country roads. Many of the cathedral records in England have entries noting the expenses of the casting of their bells.

It appears that the first peal sent to England was presented by Pope Calixtus in 1546, to King's College, Cambridge; this was the largest set of bells in England for 300 years. In the eighteenth century, bell ringing became more the fashion, and the demand increased the supply. The greatest bell in the world is at Moscow, Tsar Kolokol; it was cast in 1733; it is nineteen feet high and weighs 440,000 pounds; it has never been rung because it came from the mold cracked. It is mounted on a scaffold in the Cathedral Square and is now used as a chapel.

"Great Paul," the London bell, was cast under the direction of Sir John Stainer, by Taylor & Son in 1881; it cost $15,000 all told and weighs sixteen tons and a half. It is said to be the largest bell in the world which is rung swinging, which is not correct, as the Cologne bell, which weighs eighteen tons, is thus rung. Lord Grimthorpe, a lawyer of no mean quality, seemed to have had evidence which satisfied him, that the sound of the London bell

FIG. 6.—THE MOLDS READY FOR THE CASTING.

had been heard at Windsor, twenty miles away, but it is as yet one of those unexplained phenomenon, why a bell can be heard for many miles, when wind, which is hardly sensible, is moving in that direction, when it cannot be heard for half a mile in the opposite way. Our bells sometimes cannot be heard three blocks away, in a certain direction, and yet at the same time the sound carries three or four miles in another. When they are swung in the great tower of the cathedral, which will be 200 feet high, they will be five times higher than their present location, and then the whole city will hear them whenever they are rung.

The whole subject of bell sounds is as yet in a crude condition.

In my father's church, in Yorkshire, there was a celebrated peal of eight bells. Change ringing in England is a favorite pastime. By following certain rules, the bells can be rung in a different position each time round. It would take ninety-one years to ring all the changes possible on twelve bells, at two strokes a second. In most belfries there are records kept of the ringers having accomplished some ringing feat, in which 5,000 or 6,000 "changes" were rung without an intermission in five or six hours; and it is a matter of no small emulation with sets of country ringers, who can ring the greatest number of "changes" in the most perfect manner. The more bells, of course, the greater the number of "changes" possible. In order, therefore, to increase the possibilities of their art, the Otley ringers begged the people of the town to add two bells to their peal of eight. These two large bells were cast by Mears of Whitechapel, and in due time were placed in the steeple. The grand opening day was attended by the ringers from far and near; and although these two bells were of excellent tone, when rung by themselves, to the perplexity of everybody, when rung with the peal they could not be heard. They were taken down and sent back to London as useless, and the subscription was expended in the expense of the transit.

A somewhat similar phenomenon is exhibited in organs; if you put into an organ two open diapasons of the same scale; you do not, as you might well suppose, double the effect of one; the sound of the second stop in some way or other is absorbed and rendered impotent. We have much yet to learn in the field of practical acoustics.

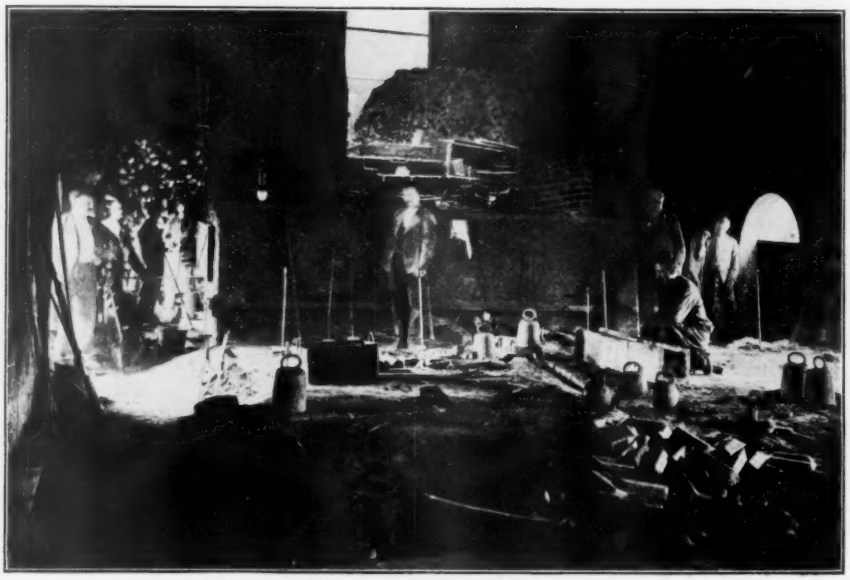


FIG. 7.—THE PIT CONTAINING THE MOLDS, FILLED WITH SAND AND WEIGHTED DOWN.

The financial history of these bells contains some very striking passages.

A protective tariff, which is in vogue in this country, is supposed to enable a manufacturer to compete with firms in the old world. Uncle Sam, with this in view, taxes stained glass windows and bells 45 per cent of their cost, and although the states refrain from taxing church property, the federal government has no such wisdom. But there are certain things of art which cannot be produced with perfection unless in a sympathetic atmosphere, which time and circumstances alone can produce. The practical and the artistic are not in the same category.

We paid Uncle Sam $3,703.50 duty, and the freight from Hamburg to Denver was $607, and yet the total cost of the chime, with all the apparatus necessary for ringing, only comes to 32 cents a pound of the weight of the metal in the bells; which is about half the cost of home-made bells.

Meneely of Troy, N. Y., has supplied two sets of chimes for Colorado. One of them, of nine bells, weighs 9,000 pounds, and cost $6,500.

The cathedral bells weigh 36,806 pounds; the tenor, "Big George," weighs 9,240 pounds; and they cost in Denver $13,000.

So that the German makers can supply, despite freight and the exorbitant duty, five pounds of bell for $2, while the American makers can only afford to give three pounds for the same money.

The freight, too, has its lesson. We purchased an organ in Philadelphia—its weight was 13,000 pounds, the cost of transit was $670; whereas these bells were brought from Hamburg to Denver, and insured, for $607, and they weighed 41,000 pounds.

These startling inequalities ought to make some people think.

Trouble in Plating.

Inquiry:—We are having a little trouble in our nickel room. We cleaned the vat and returned the solution to the vat after straining it. Since the solution has been returned it does not nickel castings heavy enough, and then some of the nickel peels off. We also find that it will not give a white back-ground, but leaves black streaks on the nickel. When the current is on, the solution foams up on the top forming a yellow colored foam. It nickeled all right before the cleaning.

Answer:—The information given in the inquiry as to the cause of the difficulty is not complete enough to give a definite remedy. I have no doubt, however, that in removing the solution from the tank it was placed in unclean barrels, such as vinegar, oil or whiskey barrels. This invariably causes just such trouble. The solution should be tested with litmus paper, and if found alkaline, a small quantity of sulphuric acid with water should be added. If it is found acid add a small quantity of liquid ammonia. The solution should first be thoroughly boiled to remove as much of the impurities as possible before adding either acid or ammonia. Then enough of the double nickel salts should be added to make the solution so that hydrometer will stand at 7 B.

H. J. HAWKINS.

Some Inquiries Concerning Mixtures.

We have received an inquiry from one of our subscribers asking a good formula for metal for lining coal neck bearings for us in rolling mills.

A good formula for metal for lining hot neck bearings used in tin plate and other iron rolling mills in which the bearings are subjected to severe shocks and the necks of the rolls become quite hot.

A formula for acid proof or anti-acid metal for use in paper mills and tin plate mills. Also the precautions to be used in casting such a metal.

A formula for brass for cold rolling.

We shall be glad to receive answers for these from any of our subscribers.

BRASS FOUNDRY NOTES

BY C. VICKERS

Casting Brass Cylinders.

Inquiry.—We would like some information concerning the pouring of large brass cylinders. We have been successful in pouring small brass cylinders, but find some difficulty when we reach a size of 24 inches and larger. The top part of the casting will be clean and nice. The mold is vented in two places, at the top. We have tried pouring the metal from the top and from the sides, but with the same results. We always find in the bottom or drag side of the cylinder a great many holes that are clean and not dirty. In making all cylinders for water lining, which is the purpose for which these are used, is there any particular composition of metal which you have

found more successful than others? Also is there any particular manner of making up the mold, or making the cores? We skin dry the molds and have been using what we have supposed to be well vented, solid cores of the usual composition.

Answer.—There are two ways of molding brass cylinders or bushings: viz, vertical and horizontal.

Short bushings up to 8 inches in diameter and less than an inch in thickness are more easy to make horizontally, being poured from one end, and the mold inclined. Over one inch in thickness they are very apt to shrink on the cope side, necessitating the use of a high head, and a heavy sprue to feed the metal and keep it up, for this reason they are best cast vertically, poured from the bottom and fed at the top.

A bushing or cylinder more than 8 inches in diameter may be cast either horizontally or vertically, and its length will determine the most convenient method of molding it. Anything under, say, 3 feet 6 inches in length, can be more safely molded in the vertical position. A pump cylinder of 24 inches diameter if cast vertically may be made with a green sand core, and give a nice clean casting. It should be poured simultaneously with two pots on opposite corners, gated at the bottom, a couple of suitable sized risers being taken off the top of the casting on the opposite corners to the pouring sprues. A three parted flask is used, the partings being at the top and bottom of cylinder. Other partings are often made in the check to divide the mold for more convenient handling. If the cylinder is very light, it may also be gated at the top, as well as the bottom as good judgment may suggest to ensure a perfect casting. In vertical molding it is important the sand be not too wet and the mold be carefully rammed. Cylinders too long to be conveniently cast vertical, such as pump plungers, are cast horizontal, and the cores may be made solid or swept up in loam on barrels. With a solid core provision must be made to support the weight independently of the sand prints, otherwise the casting will be thicker on one side than the other.

If the sand pile is close or fine, to prevent scabbing, blowing and other troubles, the mold should be faced with the following facing:

Old molding sand	4	parts.
New " "	3	"
Lake sand	3	"
Flour	1	part

mix with stale beer, molasses or clay water, slick the mold well, coat with a good plumbago wash, and skin-dry deep by means of a charcoal fire. If the sand is free and open such molds can be cast green, without the slightest trouble. The mold must of course be carefully rammed and vented, well slicked, and coated with dry plumbago, using a camel's hair brush, to give a smooth surface to the casting. For this class of work the sand should not be finer than a No. 2. A good sand is No. 2 Albany.

BABBITT METAL.

The writer used to be a believer in the theory that a babbitt metal which will streak paper, contained lead. Lately however I found I was mistaken. All babbitts will streak paper more or less; if they are pressed hard enough the ones that really contain lead will however make the heaviest mark.

A genuine babbitt made with ordinary casting copper, will not be equal to the same alloy made with a deoxidized copper.

A good way to judge the quality of a babbitt is to examine the fracture.

A tin babbitt will show a lighter fracture than one containing lead. A first class babbitt should show fibrous fracture.

A metal contaminated with oxide spots is poorly made, and can not be considered a good babbitt even if it be a "genuine."

Phosphorus as a deoxidizer should be used sparingly in babbitts. It cannot in my experience be used with the same freedom as in brass, because it causes the metal to flow sluggish and adhere to the molds.

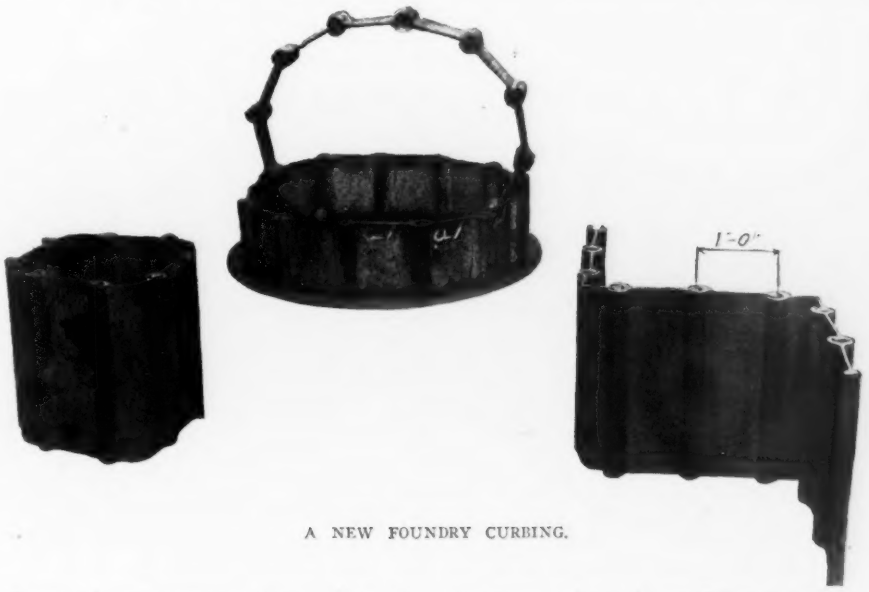
The McShane Bell Foundry Co., of Baltimore, Md., purchased the bell business of the Henry McShane Mfg. Co., over a year ago. Recently the remaining effects of the Henry McShane

Mfg. Co. were offered for sale, and the McShane Bell Foundry Co. purchased the patterns and much of the machinery, and will continue the business of the former company.

A NEW FOUNDRY CURBING.

It is the man who keeps his eye on what the other fellow is doing that is often able to obtain help in his business from very unexpected sources.

The question of the best foundry curbing, has certainly been a live question for a long while, and many forms of cast iron segments have been developed, which hooked or fitted together in some manner to form an adjustable curbing, but the objection to cast iron in all cases is the fact that it is liable to break and result in a run out, which may not only cause the loss of the casting, but do serious damage in the foundry. Sheet steel curbing of various forms is largely used, but in this case it is necessary to rivet on suitable formed pieces for latches or hinges. The United States Steel & Piling Co., of 135 Adams street, Chicago, have developed a form of steel piling used for sheet piling in connection with excavation work. In cutting up the mill lengths of this piling into lengths ordered, many short pieces result, and the idea of using these for curbing in the foundry has been tried, and it has been found that they make excellent curbing. The accompanying illustration shows how these pieces can be arranged. By bending the webs of some of the pieces approximately square rectangles may be formed. After the sand has been rammed back of the curbing there will be a sufficient amount of tension on the joints to hold them rigidly in place. For ordinary curbing purposes, the segments could be cut into lengths of from 12 to 20 inches. There are probable cases, however, where it would pay to have lengths of from 30 to 36 inches on hand in connection with special work.



A NEW FOUNDRY CURBING.

CARNEGIE TECHNICAL SCHOOL FOUNDRY STARTS.

We received a letter on March 14, announcing that the first heats have been taken from the cupola in the foundry department of the Carnegie Technical Schools of Pittsburg, Pa. The cupola is 24 inches in diameter, and heats have been taken off by both the day and evening classes, under the supervision of Mr. Edmund Fuller. The castings made were for use in the laboratories, including test bars and other pieces required.

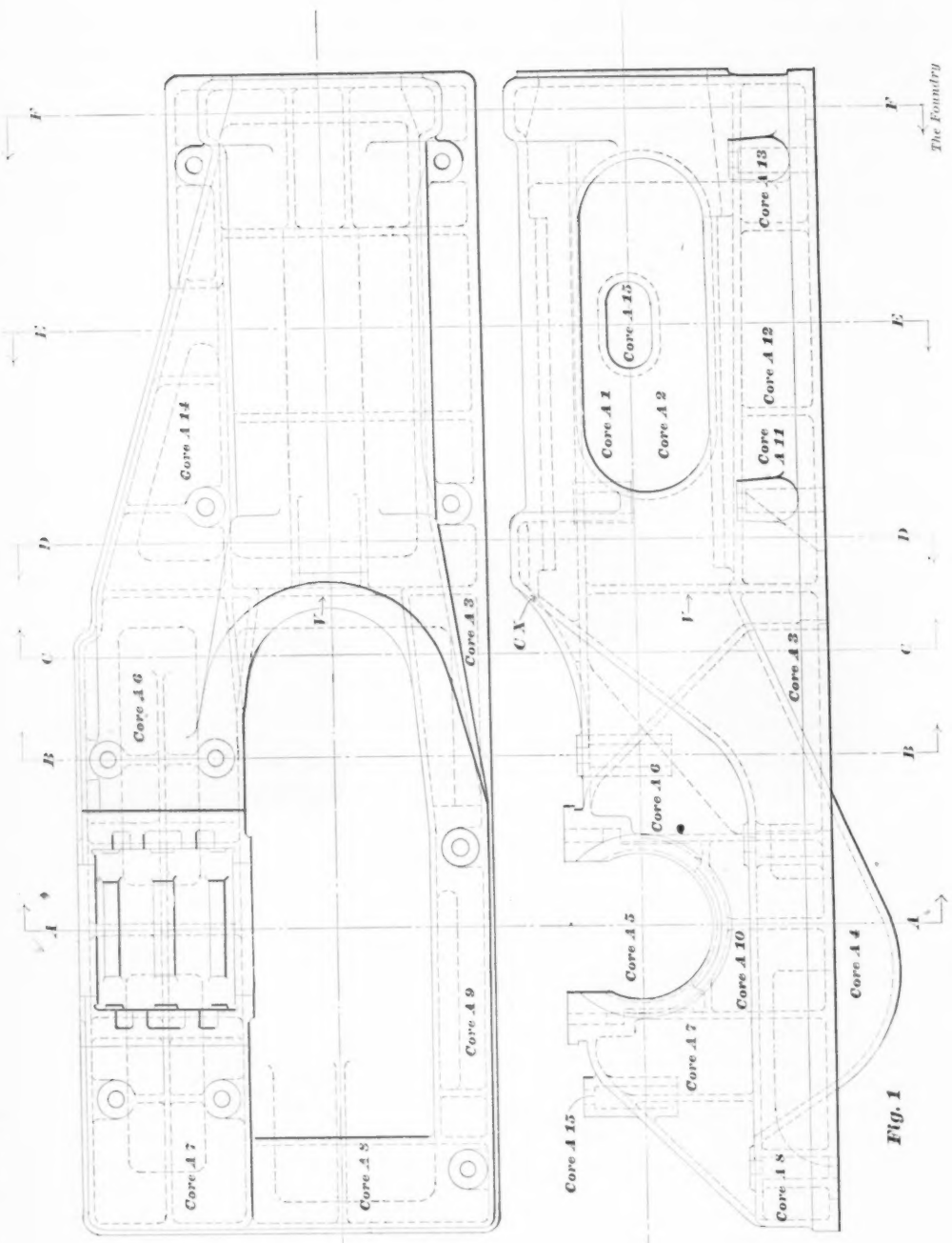

Core A 14
Core A 6
Core A 7
Core A 8
Core A 9
Core A 3
Core A 1
Core A 2
Core A 15
Core A 13
Core A 12
Core A 11
Core A 16
Core A 5
Core A 10
Core A 7
Core A 4
Core A 15
Core A 18
The Foundry

Fig. 1

THE PATTERN SHOP

PATTERNS FOR HEAVY ENGINE BED.

BY H. J. MCCASLIN.

Engine frames or beds assume various forms being chiefly designed to suit the work and requirements in each particular case. Shown in the accompanying illustration is a familiar form of a heavy duty, or what is sometimes termed the Allis type of bed. This form is especially adapted to heavy mill work, and the engines are frequently made and connected up in pairs, the dimensions assuming large proportions. The one under discussion is the right hand bed of a pair of reversible, piston valve blooming mill engines. The general practice with concerns building engines of this type is to construct the bed patterns so that they will serve for both right and left beds, and also for engines of different strokes. There are a number of different ways in which a pattern of this nature can be constructed, and it may be difficult to decide which is the most practicable and economical both for the pattern maker and the molder, for in all such work both the pattern making and the molding should be taken into consideration. As the duplication of these bed castings is frequent with concerns doing this class of work, the construction of a complete pattern is usually considered the most economical. The pattern can be constructed to serve for both the right and left bed somewhat after the manner illustrated and described in this article. Figure 1 shows the plan and elevation of the bed showing its general outline and the metal distribution. It also shows the points at which the cross sections illustrated in Figures 3, 4, 5, 7, 8 and 9 were taken. These cross sections should receive close attention from the pattern maker, in order that he may obtain a thorough knowledge of the requirements in making up the core boxes.

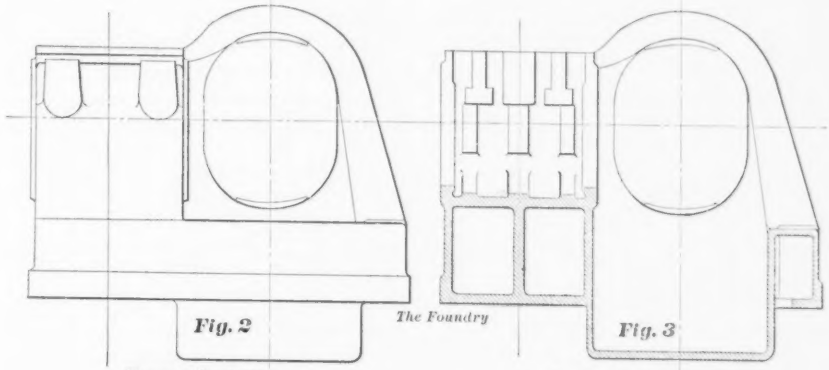


Fig. 2 *Front End View*

The Foundry

Fig. 3 *Section A-A*

Viewing the frames from the front it would appear as illustrated in Figure 2, while the cross section on the lines AA, BB and CC would appear as shown in Figures 3, 4 and 5. Figure 6 shows the outline of the back or cylinder end of the frame, while Figures 7, 8 and 9 illustrate the cross sections on the lines DD, EE, FF as they would appear from the cylinder end.

Of course, the first thing would be for the pattern makers, foundrymen and others interested, to get together and

thrash out the general discussion of the molding, shrinkage, arrangement of cores and the construction of the pattern. When this has been done a full sized layout giving both the plan and elevation with core outline or metal distribution is essential. It is also necessary to draw a number of cross sections, say for instance, AA, DD, EE and FF. To economize the layout board surface, these layouts can be made over one another and dotted in with different colored crayon or schellac, which will enable the workmen to distinguish one section from another without difficulty. The shrinkage usually allowed is 1-12 of an inch per foot, with a liberal allowance for finish upon all machined surfaces.

It might be well to state that in the construction of large patterns the closer the exact dimensions are worked to, the easier will the work be completed. That is, allow scarcely any material for dressing to size. Place what draft is desired upon the frames, and enclose them with the required thickness of material. Then the only work necessary is the cleaning and sandpapering of the pattern.

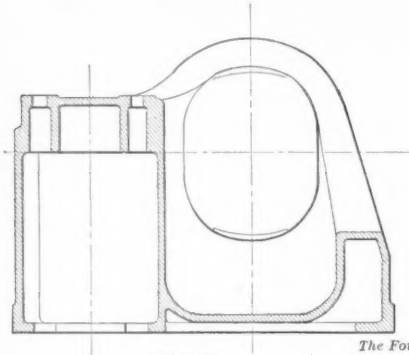


Fig. 4

Section B-B

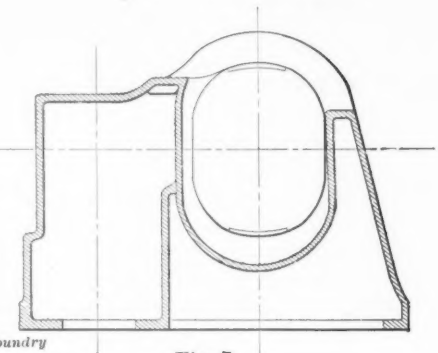


Fig. 5

Section C-C

To facilitate the altering of the pattern for different strokes, as well as the handling and storing of the same, it is built in sections and assembled as illustrated in Figure 10, which shows the general construction, the joints of the various sections or parts, together with their attached core prints, loose pieces, etc.

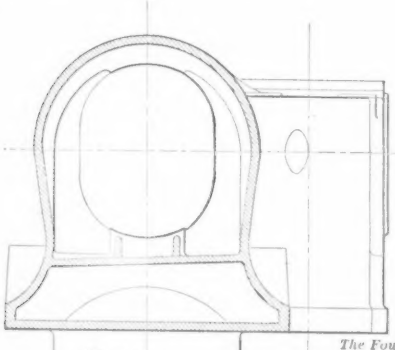


Fig. 7

Section F-F

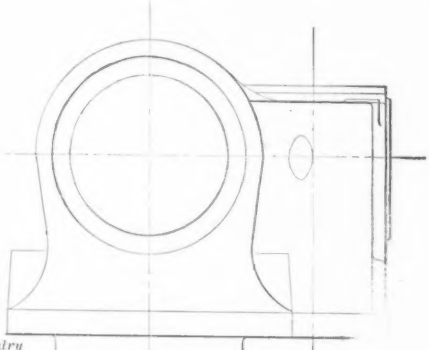


Fig. 6

Back End View

To aid us in referring to the different sections or parts during a discussion of their construction, let us designate them as sections 1, 2, 3, etc. Sections 1, 2, 3 and 4 comprise the forward or bearing portion, while sections 5 and 6 comprise the cross head housing, and part 7 the bracing member. As section 1

usually receives the initial attention, let us proceed with its construction as shown in Figure 2. This section, together with sections 2, 4, 5 and 6 are used for both right and left hand beds. It will be observed that in using this section for both right and left hand patterns it is necessary to make right and left hand corner pieces G and H, and also to provide for the reversing of the strips forming outline of the crank-pit core print 1, and the covering material J, Figure 11.

The frames can be gotten out, secured together, and the sides enclosed somewhat after the manner illustrated. Offsets are formed on the line KK to receive the right and left hand corners G and H, which are next built in place and secured with dowel pins and screws. The covering material J is next added, and the strips forming the outline and thickness of the core print I attached. This manner of forming this core print answers the purpose very well, and permits of an opening through the pattern to facilitate the ramming of the mold. In closing the bottom N, the material can be cleated together in two or three sections, which permits of its easy removal of screws, pins, etc., and for the repairing and drawing of the pattern.

Figure 12 shows a plan, elevation and end view of section 2 of the pattern. The frames O, as shown in the end view are nailed and screwed together, and covered with stock to form the required outline. As this section is employed for both right and left hand patterns, it is necessary to make an offset on each side along the lines LLL. This space is then filled with a right and left hand piece shown in Figure 13 above and to the right of the views shown in Figure 12. In Figure 12 the right hand piece is shown in place.

Next the core print M is attached, a section of which is shown in greater detail to the right of the plan. Attention is called to the strip P around its outer edge of this print. The strip being added to assure a perfect setting of the core, for any sand disturbed in the placing of the bearing core in position, will fall down below the seat of the core and into the depression left vacant by the strip P.

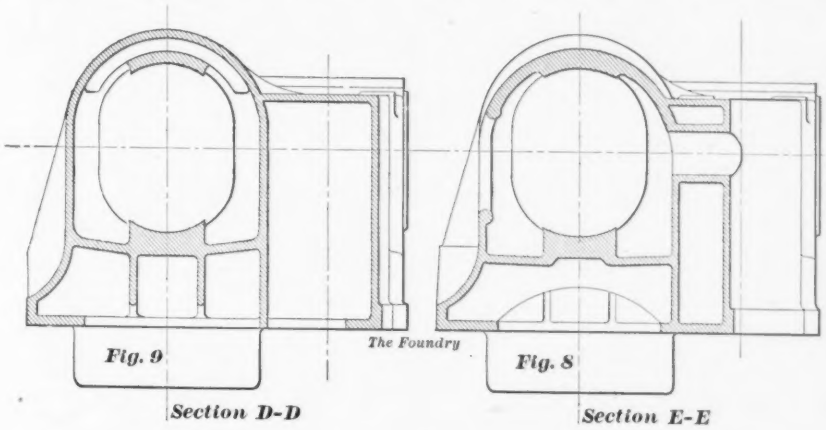


Fig. 9 *Section D-D*

Fig. 8 *Section E-E*

The loose facings and the holding down both lugs, having been gotten out are attached with loose dowels, and this section is then ready to be placed in position upon section 1, the two parts being secured together with dowels and screws. These dowels and screws must be so arranged that they are getatable when the bottom is removed from section 1.

It is next necessary to construct that part of pattern designated as section 3, as shown in two views and a section on the line QQ in Figure 14. For this section it is necessary to build a complete right hand and a complete left hand piece. Owing to the irregular form this section is the most difficult to construct, and it is advisable to build it in its correct position upon section 1, with the end fitting against section 2, as

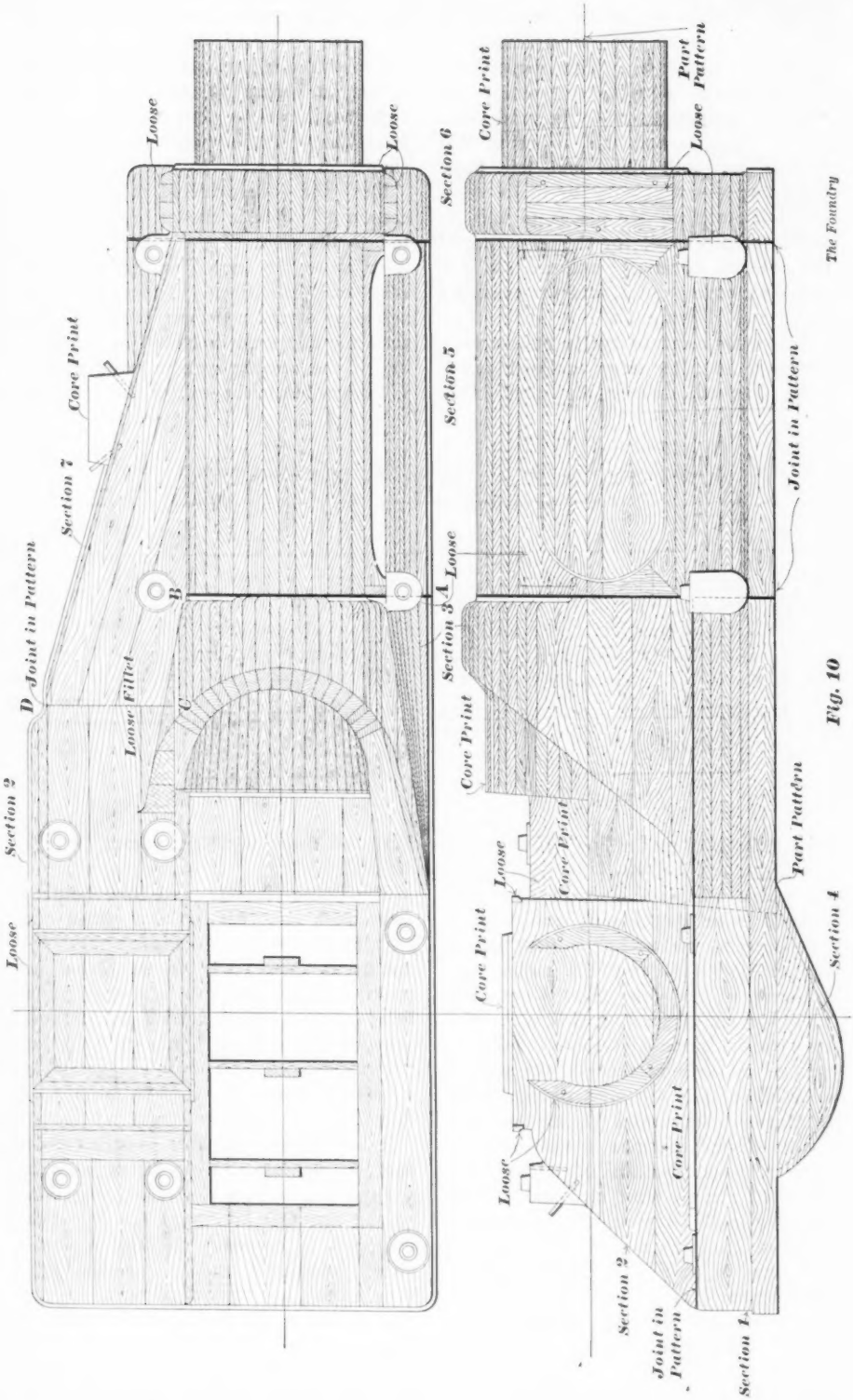

Loose
Loose
Section 6
Core Print
Part Pattern
Loose
Core Print
Section 7
Section 5
Joint in Pattern
D
Joint in Pattern
Loose Fillet
B
Loose
Section 3
A
Section 2
Core Print
Core Print
Loose
Core Print
Loose
Core Print
Part Pattern
Section 4
Core Print
Loose
Core Print
Section 2
Joint in Pattern
Section 1
The Foundry

Fig. 10

shown in Figure 10. The lower part of the core print to the center line or height R, and with a width equal to S, is first framed up and the top and end closed in. The projection which fills in the offset on the line LL of section 2, built up as shown at Y. The arch frames T and U are now gotten out and placed in their correct position. These frames differ in form, frame T being of an elliptical shape, while U is circular. As the required opening is given through the rib D, section 1, it will be found convenient to locate frame U at this point and lay it out accordingly. Of course, allowance must be made for the round

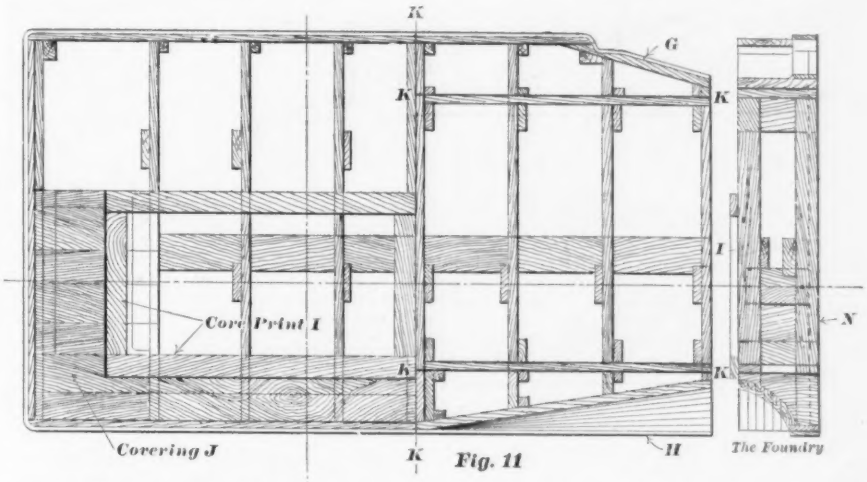


Fig. 11

corner CX, Figure 1, which would make the core print that much larger in diameter. The lagging is now placed on and dressed to its proper form. Frame W is then set in position, and the width X built up to the point of tangency with radius Z. Lagging *a* is now fitted on, dressed to form and the fillet *b* worked out.

Section 5 as shown in plan and cross section in Figure 15 forms the cross head housing, and is used in both right and left hand patterns. The use of this piece for both right and left hand patterns necessitates the building of oblong openings in each side, the one not in use being closed or stopped off by the bracing member or section 7, Figure 10. It will be observed that this part of the pattern is built the full height and secured to the end of section 1 and 3 with pins and bolts. The frames are usually gotten out as shown in the cross section *de*. These frames are lagged over forming the depression C on sides. This depression has a depth equal to the metal thickness which allows the core to cut through when placed in the mold. The oblong openings are now built in with that portion above the center, as shown at *g* secured with pins, so that it may be drawn in after the pattern is removed from mold.

The cylinder end of section 6, is shown in two views in Figure 16. This portion is used for both right and left hand patterns with practically no change. The frames, two in number, are gotten out and secured together. It will be observed that the outer one, as shown in the end view is partially closed leaving a square opening to be covered with the attached core print.

There two frames are lagged over, provision being made to secure the loose pieces HI which are left detached from the pattern to facilitate in drawing it from the sand when using a two part cheek. These loose pieces are next fitted in place, secured, and the entire pattern dressed up, corners rounded, etc.

The core print, one-half of which is shown in two views Figure 17, are staved up, forms being gotten out and covered with lagging and turned in halves, the lower or drag half is secured in its proper position to section 6 with screws and loose dowels, and the upper

half placed upon the lower half. Segments forming the loose facings JK are next attached when its section will be ready to secure to section 5, as shown in Figure 10.

Section 7—or what is sometimes termed the bracing member, is shown in three views Figure 18. It is necessary to make both right and left hand patterns for this. The section is built in its proper position to the assembled sections, as shown in Figure 10, the frames having been nailed up with ample stock allowed for fitting and sawing to size. They are fitted to the sections 2, 3 and 5 and secured in place with screws and pins.

The proper outline of the sections is next laid off upon them; they are then removed and sawed to size and returned to their proper position, where they are secured and well braced together. The material enclosing the top and side is next placed in position and dressed up, and the core print LM attached.

The large fillet shown in two views in Figure 19 is gotten out, and fitted in place up to section 3 and worked out to shape.

With a dressing up and finishing of the assembled sections of completed pattern, this part of our work is done, with the exception of the crank pit extension, as shown in two views in Fig. 20. This is constructed by getting out sides and center rib, securing them together with separating pieces and then lagged up. To avoid the end grain of the material used in the lagging, shown on the sides of the pattern, the sides are gotten out of the required form, and the lagging fitted so as to butt against the inside of these pieces, that is, to fit between them. This necessitates a segment, which forms a shoulder to receive the lagging, and is placed in position and secured to the inside of the side pieces. The lagging afterwards is placed in position and dressed off to conform to the sides. This section is used for both right and left hand patterns. The one change necessary is the change of its position on section 1.

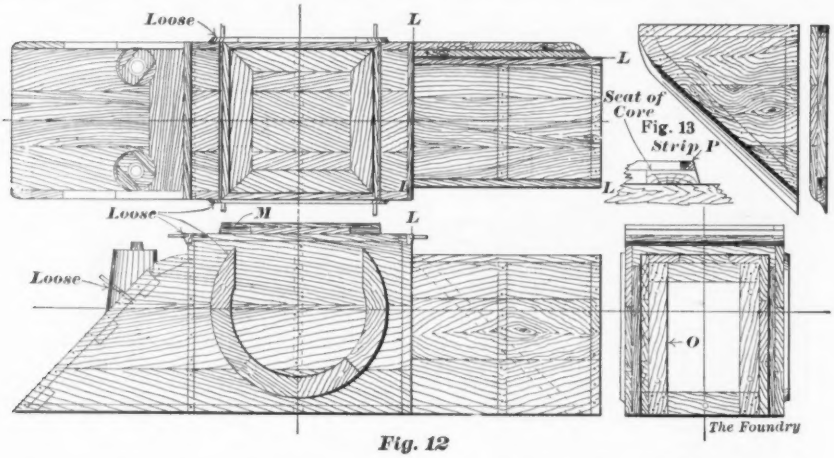


Fig. 12

The holding down bolt lugs, etc., are now fitted to the assembled pattern. The various sections given designating marks, so that they can be returned into their proper relationship one to another, after which the pattern is dismantled and set up in a reverse position as required for the left hand pattern, the various left hand sections built in just as the right hand sections were.

Construction of Core Boxes.

The core boxes fifteen in number, next claim our attention. For convenience in referring to the various core boxes employed in forming the interior of the frames they are designated, A1, A2, A3, etc., the location of the cores being shown by the letters placed on Figure 1. As the most of these boxes are of simple construction, we will illustrate only those, with the exception of A3, receiving core print settings. The ones illustrated embrace the most intricate

boxes in the set. All of the boxes are made of rectangular form, and are all emloyed for making both right and left hand cores. The form of the cores and changes from right hand to left hand being made by changing the position of the filling in pieces, or by the use of right and left hand sections of the boxes.

We will first consider the construction of the boxes used in forming core A1. This core forms the upper half of the interior of the cross head housing, and is supported in the mold by its projecting core prints, as shown in Figure 10. This box is with one exception, the largest and most intricate box to construct. It is shown in plan and longitudinal section through the center, and a cross section on the line LM in Figure 21.

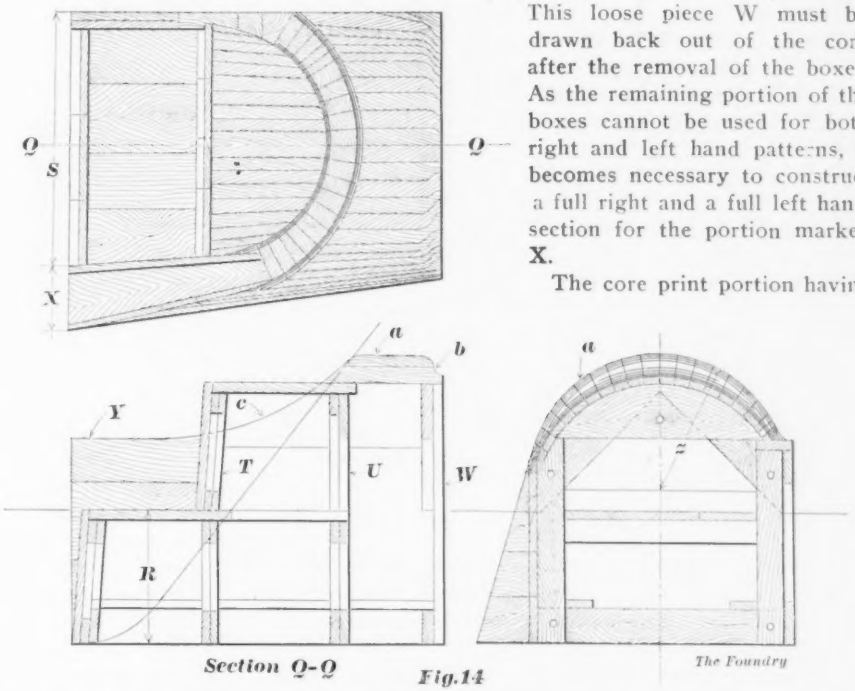


Fig. 14

Material of about 2½ inches by 6 inches for forming the rectangular frame is first gotten out and secured together in a good substantial manner, about as shown. The cylindrical part forming the projecting print portion can be staved up and dropped into place. The board forming the taper on the end of the print is fitted in separately. The segments forming the depression O are now nailed up, layed off, sawed out, dressed to the proper form, dropped into place and secured, and the staving up of the barrel is next proceeded with.

The depression R is also built up of segments, dressed out and fitted in place. It will be observed that a slight change is required at the top of the box at this point, for the right and left beds, and that this necessitates the changing of the blocks S and T. The cross head guide U is now lagged in with the shoulder V arranged as shown to support its projecting end, or loose piece W. This loose piece W must be drawn back out of the core after the removal of the boxes. As the remaining portion of the boxes cannot be used for both right and left hand patterns, it becomes necessary to construct a full right and a full left hand section for the portion marked X.

The core print portion having been lagged up and dressed out to conform to the core print of the pattern, the outline of the round corner is next laid off or transferred to the surface. This can be done very nicely and accurately by placing heavy paper over the core print on the pattern and fitting it up against the rounding, or the intersection of the core print and the pattern. The paper is then placed in the correct position in the core boxes, after which the filling in pieces or lagging, are fitted to its outline as shown by Z.

Material is now added from which the pockets AB and AC, as shown in section LM, are worked out. The blocks or

loose parts AD and AE are fitted above the pockets AB and AC. It will be noticed that these loose pieces AD and AE must be removed and the openings left vacant by them filled in with green sand to support the overhanging projections after the box has been turned over upon the core plate. The board AF is now fitted into the end of the box to give the proper taper to the end of the core. The core print AG which is suspended from the top of the box is located and doweled in place. This core print AG forms the interior setting for the side of the cross head housing to the opposite side of the box. The suspended core AG is also changed from one side of the box to the other.

Figure 22 shows a plan, a longitudinal section through the center, and a cross section on the line AH of the core box used in forming the core A2. This core when placed in position upon core A1 completes the interior of a cross head housing, and also the exterior part of the bed leading down into the crank-pit. While this illustration is almost self explanatory a few remarks may not be

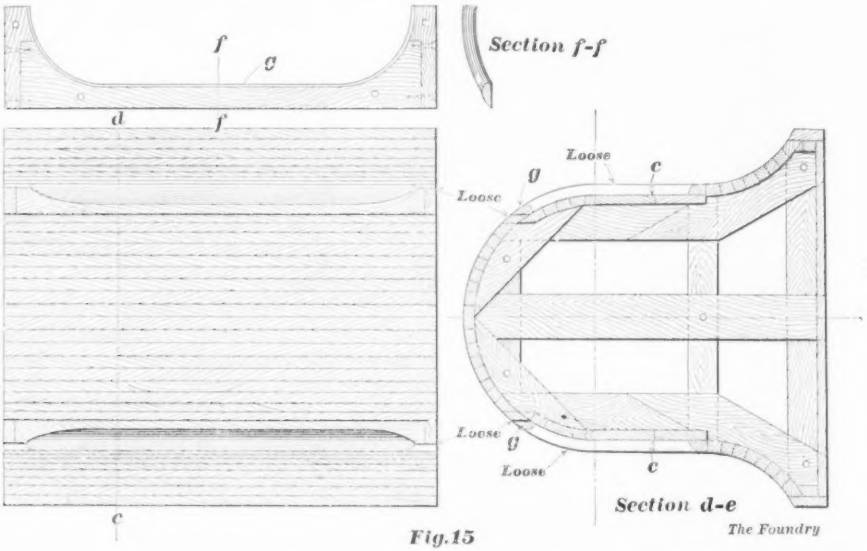


Fig.15

the oblong core A15, which passes through the core A14 intended to form the interior of the bracing member. This core print is made longer than the setting of the cores requires owing to the fact that the core has to be placed in the depression left vacant by the core print, and then shoved forward through the core A14 and into the impression of the core print on the pattern. The portion of the core print left vacant after the core A15 has been shoved to its final position may be stopped off with sand.

This completes the core box for the right hand bed. In making the changes for the left hand bed it is necessary to build a left hand section X, and to get out pieces S and T of the opposite hand. It is also necessary to change the beading P around the oblong openings in out of order. The frame is constructed about the same as for the box previously described, and the filling-in sections made, dropped into place and secured to the frame. It will be observed that the only two sections employed for both the right and left hand beds, are the center section or that part which contains a cross head guide, and the round core print H1. With the two parts H1, and the part for the cross head in place, the bottom board Y is fitted in, and the side pieces AJ and AK dropped into place upon it. The side pieces for the center section having been gotten out and secured in place, the change pieces AL and AM are fitted in, as well as board AR, which contains the circular opening at the forward end of the housing. With the suspension of the core print AG, which can be used in

both boxes A1 and A2, the getting out of the beading AS around the oblong opening on the side of the housing, which matches the beading of the core box shown on Fig. 21, this portion

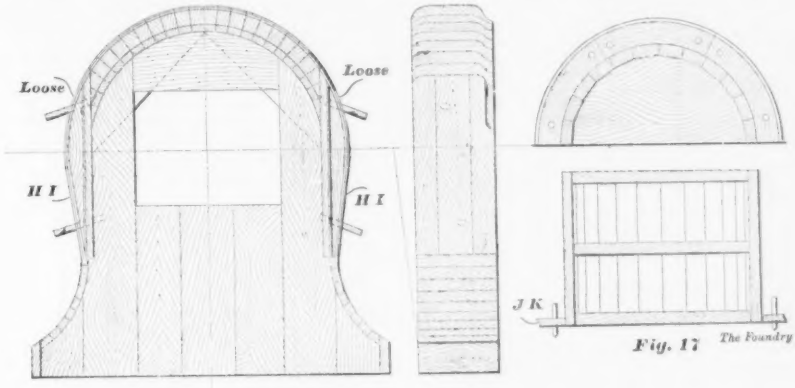


Fig. 16 *Fig. 17*

of our box is completed and the lagging in of the section AO proceeded with. Owing to its irregular form and the provision which has to be made for taking care of the rounding corner AT, it will be found convenient to make the section in four pieces and join them at AU and the sides along the line AV as shown.

Core A3 which forms the metal thickness of that portion of the frame directly forward of the cross head housing is made in the core boxes shown in plan and two cross sections in Figure 23. This is a large cumbersome box for making a comparatively light core which is due to the built up form BE, which occupies the greater part of the frame interior and conforms to that part of the frame extending down into the crank-pit. Of course, in constructing this part of the box, allowance is to be made for the metal thickness. Practically none of this box can be used for the opposite hand bed except the frame, which is put together as shown. The form BE is lagged up over supports, dropped into place and secured with pins. The material forming the outline of the sides BF and BG is gotten out and fitted in position. Referring to the

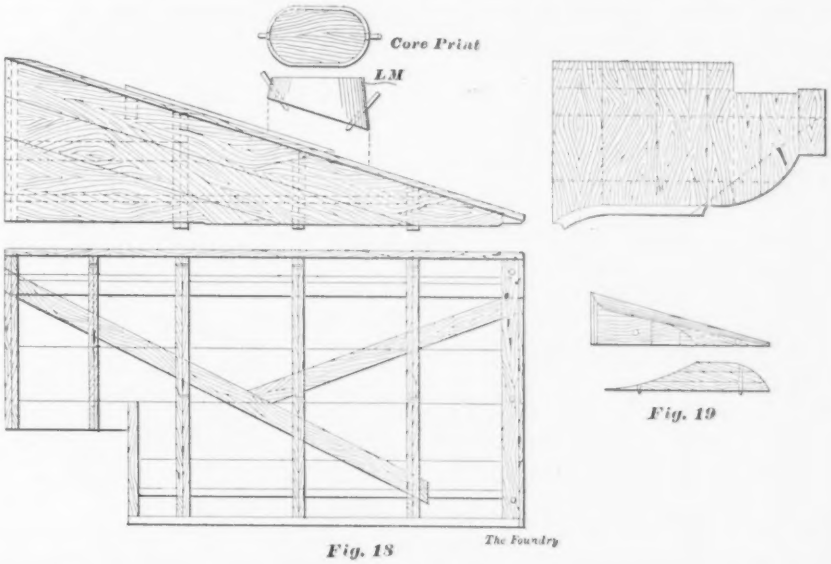


Fig. 18 *Fig. 19*

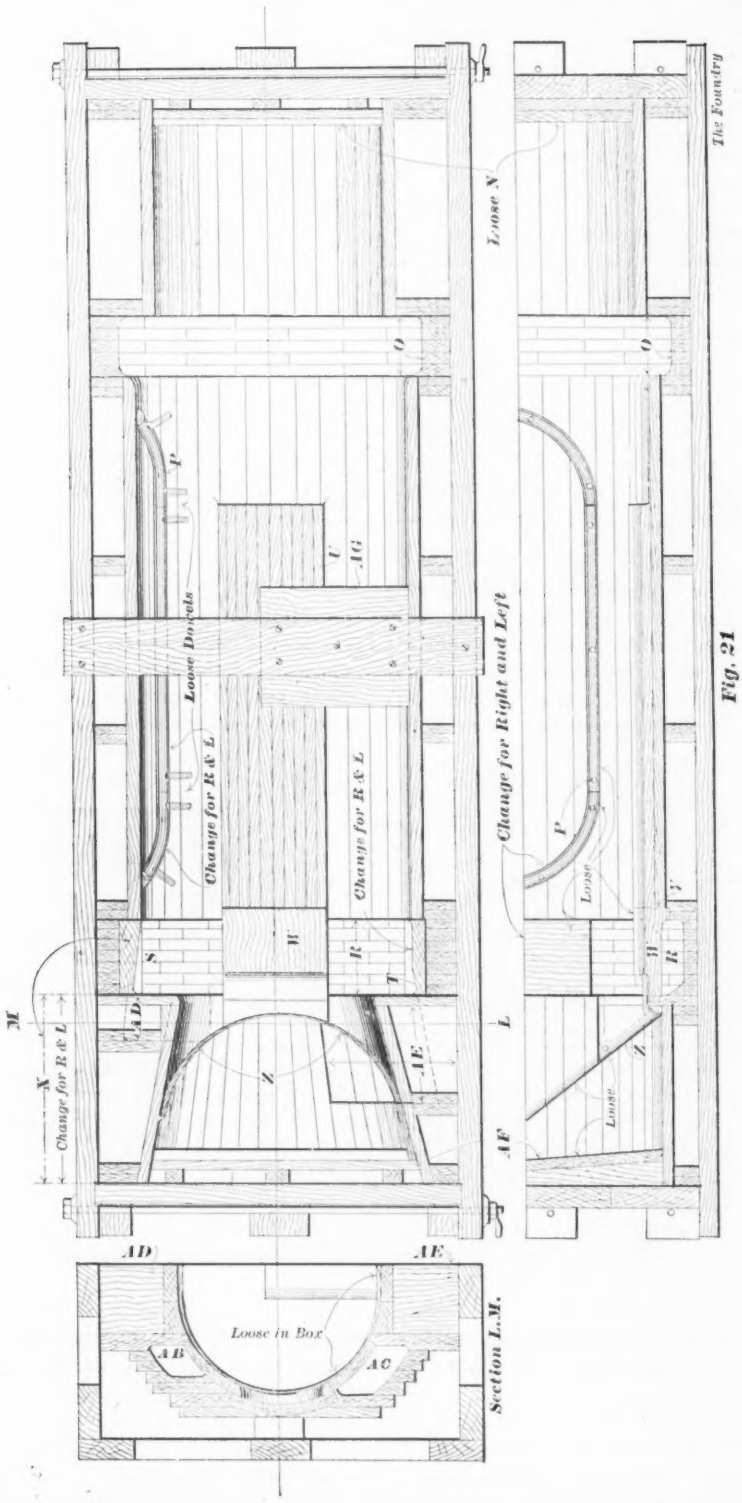
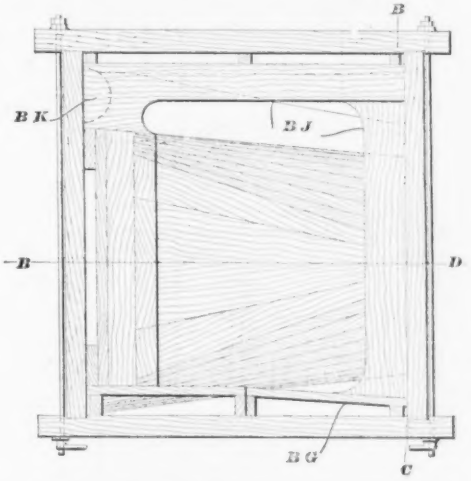
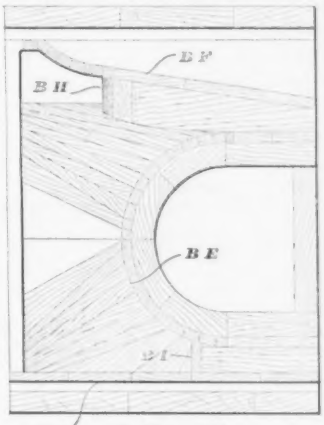

The Foundry
Loose N
O
P
U
AG
Loose Dowels
Change for R & L
Change for R & L
Change for Right and Left
Loose
W
R
T
M
N
Change for R & L
AD
AE
Z
L
AF
AD
AE
Loose in Box
AB
AC
Section L.M.

Fig. 21

cross section CC as shown in Figure 5, which gives the exact outline of the core required, it will be seen that the filling in pieces BH and BI are required to form the desired height and outline of the upright projections as shown in Figure 23. This box is completed by placing in position the internal flanges BJ and the metal thickness around the holding down, bolt boss BK.





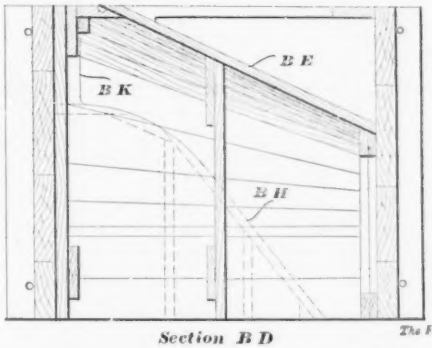


Fig. 23

The plan and two cross sections of the core boxes used for forming the core A4 for the crank-pit, are shown in Fig. 24. This box consists of a frame the sides of which conform to the desired heighth and form of the core, the box being rammed up, struck off and the pieces BN and BO which support the part of the fillet extending into this core bedded in. It will be observed that this fillet is the continuation of the fillet formed in the core box A2, and which runs out at this point in the crank-pit.

To avoid the sharp corner around the side and end of the pit, an offset as shown at BP is arranged for.

Core A5 which forms the main bearing, is made from the core box shown in Figure 25, the box being constructed somewhat after the manner illustrated. After the frame is completed the material BS forming the T head facings is made and held in place with loose pins. To form the openings through the metal on each side of the bearing material, the thickness of which is equal to the metal thickness, is dressed up and fitted to the box, and the required openings cut out. The facings BT must also be secured to the openings. The circular pieces on top of the boxes are next at-

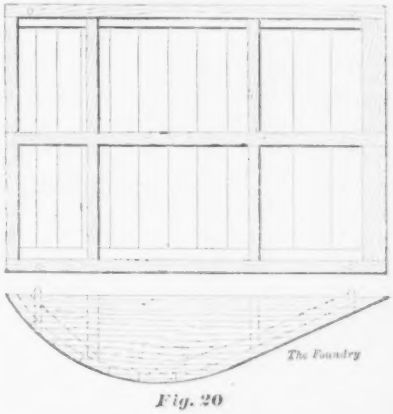


Fig. 20

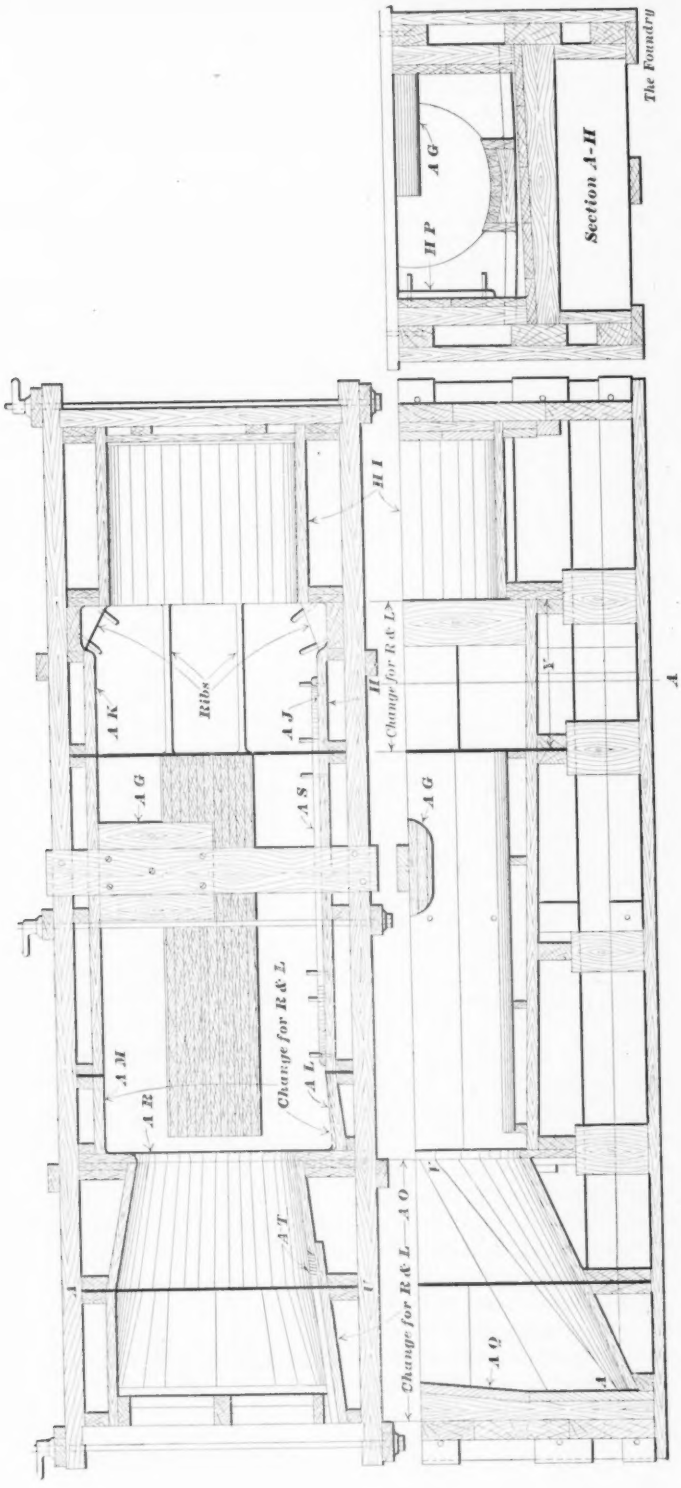

The Foundry
Section A-H
A G
H P
H I
A K
Ribs
A J
Change for R & L
A G
A S
A G
A M
A R
Change for R & L
A L
A T
Change for R & L
A O
A Q

Fig. 22

tached, and to them are secured the two supports for carrying the circular facings BU.

The seven core boxes or frames used in forming the remaining ten cores are not illustrated, as they are of a comparatively simple nature, so that a description of their general construction and manner of changing from right to left hand will be sufficient. These cores, with one exception, core A15, have no core print setting being secured in the mold and in their proper relation one to another with chaplets.

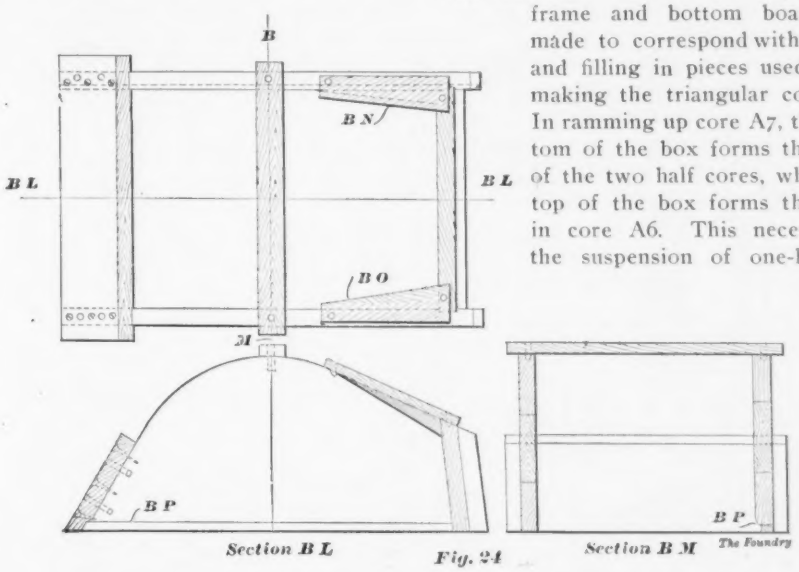


Fig. 24

Core A10 forming the interior of the bed underneath the main bearing is made in halves, the two halves being joined together with the vertical plane on the center line of the longitudinal rib. As the core is symmetrical about the center of the rib, one-half of the box without any change is all that is required, the two half cores being simply turned over and pasted together. This box consists of a frame and a bottom board, upon which one-half of the thickness of the rib is attached. Next material giving the circular form at the bottom of the bearing, and to form the internal flange at the bottom, together with the cross rib is placed in the box.

Directly in front and back of the main bearing and extending the entire heighth of the bed are cores A6 and A7. These cores are also made in halves, being parted in the same plane, that is, along the center rib as was the case in core A10. These four half cores are made from the same frame and upon one bottom board. It will be observed that core A7 is of triangular form, while core A6 is rectangular. As the latter core is the largest the frame and bottom board are made to correspond with its size and filling in pieces used when making the triangular core A7. In ramming up core A7, the bottom of the box forms the joint of the two half cores, while the top of the box forms the joint in core A6. This necessitates the suspension of one-half of the thickness of the rib from the top while making core A6, the change being due to the fact that it is necessary to fill in the bottom board with material to obtain the outline of the metal on the sides, also the internal flange holding down both bosses, etc., which are attached to the side of the box.

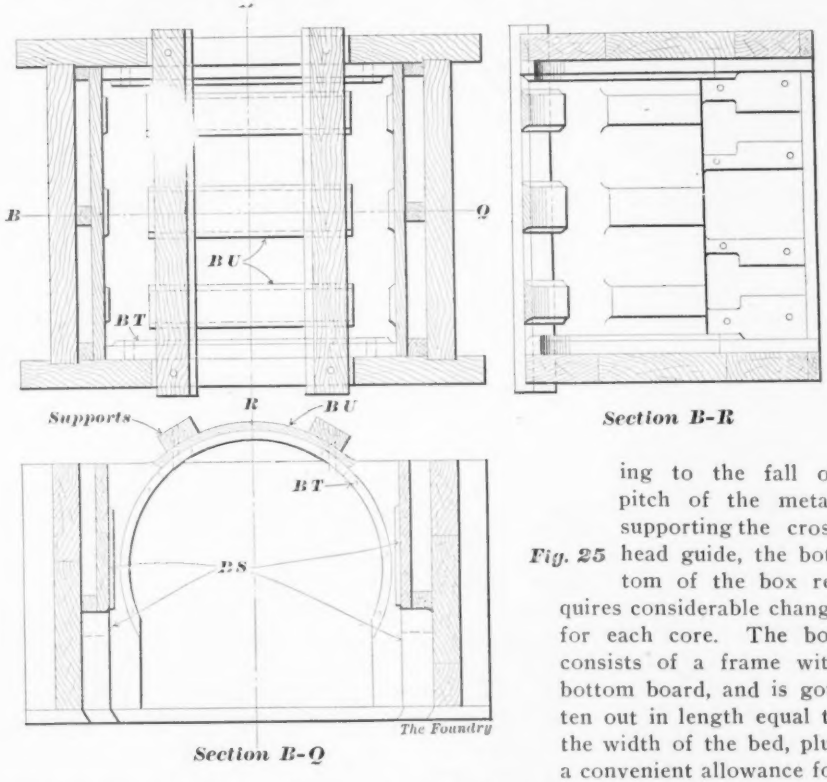
That part of the bed between the crank-pin and the extreme front, and which extends part way down the side of the bed, is formed with the core A8. This core is made in a rectangular frame with bottom board, the frame being gotten out the required heighth and length, and with a width which will allow the placing in of a rectangular stopping off board conforming to the angle of the crank-pit end. It will be seen that this stopping off board does not extend the entire length of the box,

but only that portion required in forming the metal thickness across the end, and upon a portion of the side of the crank-pit.

The material forming the internal flange across the end of the bed is now suspended from the top of the boss and the work is completed by placing in upon the bottom board and up to the end of the box, material to form the metal thickness around the holding down bolt. It is also necessary to place a rib on the center line of the bed. This rib separates the core into two parts. The box is rammed up in a reverse position to that shown in the drawing, Fig. 1, that is, upside down.

Core A9 which forms the portion of the space between the side of the bed and the crank-pit and extends from the core A8 to core A3, with the exception of the distance occupied by the thickness of the ribs, is the next one to be constructed. The ribs separating the cores A8 and A9 are on the same angle as the end of the crank pit. The box is made of rectangular form, and contains a section of the internal flange along the side of the bed, and one-half of the holding down bolt boss, the other half being formed in core A3. With the exception of the piece to form the angle at the end this box is complete.

We next turn our attention to cores A11, A12, and A13. These three cores are all made from the same box. Owing to the fall or pitch of the metal supporting the cross head guide, the bottom of the box requires considerable change for each core. The box consists of a frame with bottom board, and is gotten out in length equal to the width of the bed, plus a convenient allowance for dropping in the lagged up form, which conforms to the flaring sides at the bottom of the bed, as shown in cross section on the line EE, Fig. 8. The frame is made of sufficient depth to permit the use of filling in pieces upon the bottom board. These pieces give the outline of the cross section of the metal, as well as the proper pitch or fall toward the cylinder end, as shown in the elevation of the bed Fig. 1. The width of the frame is made to correspond to the widest core, which is A12, plus the thickness of the rib, the half thick-



Section B-Q

Section B-R

Fig. 25

ness of the rib being placed in each side of the box. As cores A11 and A12 do not extend the full width of the bed, but only to the metal thickness separating this part of the bed from the bracing member, it is necessary to use a stop off board to give the core its correct length. The interior flange is placed in at the top of the frame and supported by the lagged

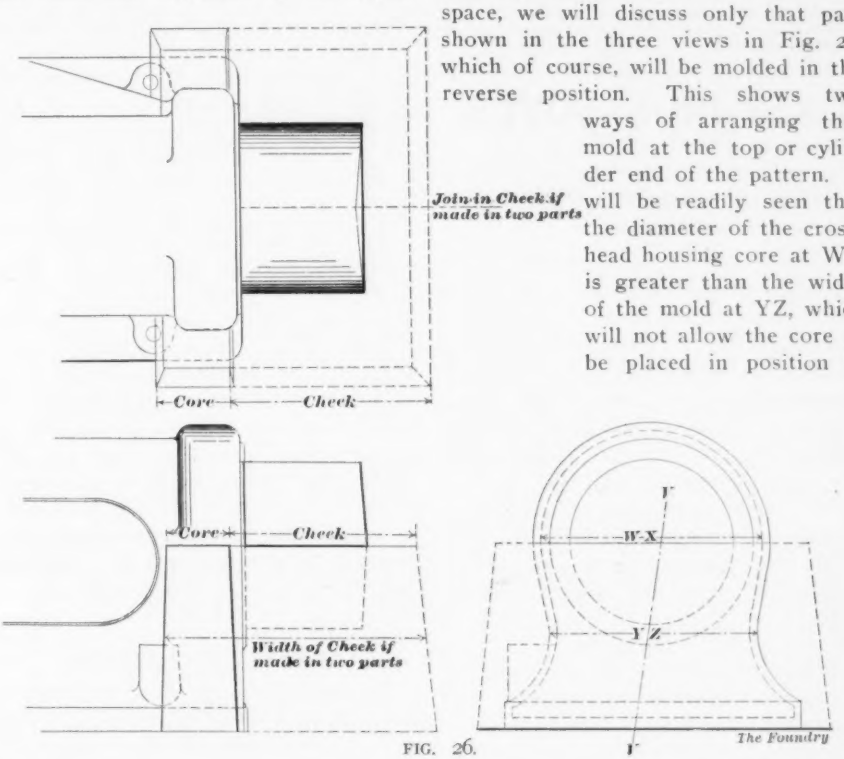


FIG. 26.

up form at the end. The changes required for A11 and A13 can readily be seen by studying the cross sections and Fig. 1.

Core A14 is of triangular shape and forms the interior of the bracing member and a short section of the flaring side of the bed at the intersection of the two parts, as shown in the plan view of bed Fig. 1. The core is made entire, being rammed up in a frame without a bottom board. The top of the frame corresponds to the angular side of the bracing member. The material forming the internal flange around the bottom of the bed is secured to the side of the box, while the metal thickness around the oblong opening formed by core A15, is provided for by an oval block secured to a support across the top of the frame.

The method of molding is known as the bedding in process, that is, the pattern is rammed up in the floor and the mold subequently skin dried. The process may embrace some points of interest, but owing to the limited space, we will discuss only that part shown in the three views in Fig. 26, which of course, will be molded in the reverse position. This shows two ways of arranging the mold at the top or cylinder end of the pattern. It will be readily seen that the diameter of the crosshead housing core at WX is greater than the width of the mold at YZ, which will not allow the core to be placed in position in the mold without coring or cheeking off the two sides of the mold. There are two ways in which this is usually accomplished. First: Core prints may be attached extending to the rounding of the corner of the pattern, as shown in the full lines, and a dry sand core used. The end of the pattern will be cheeked off, as shown by the dotted lines.

Second: The cheek may be made in two parts joined along the line VV, shown in a view at the right, and letting it extend around the sides of the pattern to the combined width of the core print and cheek shown. Of course when this latter method is employed the core prints are not attached.

METALS IN FOUNDRY PRACTICE

Devoted to inquiries from Practical Foundrymen on subjects relating to the Melting and Using of Cast Iron, Malleable Iron and Steel.

The following experts answer questions in this department:

W. J. Keep, Cast Iron.

J. B. Nau, Metallurgy of Steel and Steel Castings.

Dr. Richard Moldenke, Malleable Castings.

We have also made arrangements with several others to act as special contributors. All inquiries should be addressed to the Editor of THE FOUNDRY, and they will then be forwarded to those in charge of the different subjects.

CAST IRON NOTES.

BY W. J. KEEP.

Different Methods of Sending Addresses.

In this country we invariably give the name of town and state but rarely the country (U. S. A.).

Foreign letters generally give the name of town only. It no doubt seems to them that every one would know his town. Very often I am obliged to have the post office department find the name of the country for me. To an American some names of towns in Sweden, Denmark and even in Germany are difficult to locate unless the country is mentioned which is never done.

For instance, Husqvarna.

I sent an answer to this address which was returned with request that I complete address. I asked the postmaster to complete it for me and he found that it was in Sweden.

Iron Mixture for Gears.

Question.—Please give me the best mixture for gears.

Answer.—This question has been answered in this place a great many times. No doubt the names of various pig irons are what the founder asks for. If I should name the irons desirable for this western market he would not be able to procure them in his eastern market. No doubt he has as good irons as I could name in his yard.

The requirements are strength, a close even grain free from spongy spots and blow holes and soft enough to cut or if to be run rough, soft enough to be bored. No data is furnished as to size or how to be treated.

For gears the general composition should be silicon 1.50 per cent, phosphorus .70 per cent, sulphur 0.075 per cent, manganese 0.70 per cent.

There may be considerable variation and not materially affect the castings.

It is best to have one half of the mixture made up of good machinery scrap so as to make the grain close.

In figuring the mixture consider the scrap as containing silicon 1.75 per cent and sulphur 0.075 per cent A little powdered ferro-manganese in the ladle will help to make the castings solid.

I am in favor of using up the drillings and borings made in the shop. They can be melted after the heat is off, pigged and used next day in the regular charge. This will make a close grain and not increase the hardness.

If you want to use the borings at once pack 100 pounds closely in a wooden box, nail the cover on and charge the box the same as 100 pounds of scrap. The box will not burn until it reaches the melting point and very little of the borings will be lost. You might calculate on 10 per cent loss.

Automobile Cylinders.

Question.—Can you give me a mixture for automobile cylinders? I would like to make some of this work.

Answer.—The price of this class of work makes it seem very desirable but unless you are familiar with that class of core work I would let it alone. Probably the very best iron mixture would give in the casting, silicon 2.50 per cent, phosphorus 0.70 per cent, sulphur 0.075 per cent, manganese 0.07 per cent. The mixture would figure sulphur 0.05 per cent and silicon 2.75 per cent.

This is not a difficult mixture to make from ordinary irons but there are other things besides the iron mixture to be provided for.

The core sand, core binder, molds and experience in core making are just as important. This class of work is becoming more and more a specialty.

Some founders are devoting their whole time to it but you will find a less and less number of foundries making a few cylinders along with other work. A new job requires a great deal of experimenting before the product will be satisfactory. Success comes from the use of methods which are very different from ordinary foundry methods. I have been trying for months to make a success of a casting of this class. We succeeded lately by pouring through a gate made in a core and thus filled the mold from the bottom with no chance for a wash and by molding skimmers in the core the casting was clean. Founders that we consulted claimed that our stove plate iron was too high in silicon and too rich in carbon but we now find that there is a way to get good castings with our iron. Unless you can have work enough of this kind to make it pay for the experiments necessary it would be better to let the work go to shops who make a specialty of this class of work. It is worth the price they get for it.

Automobile work has done a great deal to develop the skill of the molder.

STEEL FOUNDRY NOTES

BY J. B. NAU

MITIS METAL.

Inquiry.—The writer wishes some information concerning mitis metal, or mitis iron castings. Would like to know how these are made and whether or not they can be made in an ordinary brass furnace?

Answer.—Mitis iron is obtained by melting wrought iron in crucible furnaces without adding anything else to the mixture. The castings thereby obtained, neglecting the slight changes that may take place during the melting of the raw material in contact with graphite crucible, are of the same nature as the raw material used.

In their manufacture, crop ends of Swedish iron are mostly used with the results that the castings obtained are soft and of excellent quality. If a wrought iron of inferior quality is melted, naturally the casting obtained is of an inferior quality. If soft steel crops are melted, the resulting casting will have a steely nature.

In their manufacture, a special furnace of three compartments with two graphite crucibles, of a capacity of about 60 pounds metal, in each compartment, or six crucibles to the furnace, is used. The furnace is heated with liquid oil from one end. The temperature obtained is high enough to melt and liquefy the metal contained in the row of crucibles nearest to the flame. Ten minutes before casting, in order to render the metal more fluid, an addition of about .05 to .1 per cent of ferro-aluminum is made. The aluminum thus introduced will react on the oxide of iron naturally contained in the liquid wrought iron, thus removing the cause of blow holes. The metal so heated will remain very quiet during the casting operation and the castings obtained will be smooth and solid.

After the metal from the first row of crucibles is poured, the two succeeding rows are advanced each one compartment and the two newly prepared crucibles are put in the rear compartment. The melting takes about 1¼ hours so that about from eight to ten heats or melts are made in twelve hours.

Each crucible lasts from five to six heats. It can be noticed that about 120 pounds of castings are obtained per heat. Special precautions are taken during the pouring of the metal.

The crucibles are made of graphite of good quality. The molds, very refractory, are prepared from refractory materials of good quality, which after having been burnt and pulverized to a fine powder are agglomerated by means of molasses or a sugar solution.

The castings obtained are better than malleable iron; they can be bent to a certain degree when cold, and can be forged when hot. Their cost price, which is not given, is said to be a little higher than malleable iron castings.

They require no annealing of any kind.

MALLEABLE CAST IRON NOTES

Dr. Richard Moldenke

AIR FURNACE BOTTOMS IN MALLEABLE PRACTICE.

At the instance of a malleable foundry where considerable difficulty was experienced in keeping the "bottom" of an air furnace in good shape, an inquiry was sent around to those malleable foundries which were known to have the furnaces. Twenty replies were received, and an interesting summary thus obtained. In order to make the information particularly valuable, there was requested the size of the heats, the number of heats made with the same bottom, the material used for the bottom, and the particulars about bottoms "coming up."

Practically all the foundries use some form of fire sand for making bottom. That is to say, a sand the silica content of which runs up very high, say over 95 per cent. Furthermore, the fluxing inpurities, such as lime, alkalies, and oxide of iron, must be very low, but yet enough to just bake the sand together, or "set" it when properly fired. The method of making bottom seems to be about like this:—The sand is spread on in layers of 1 inch or more, and fired to set it. This takes about 15 minutes. About five inches are put on in this way, the process being similar to that made use of in the open-hearth furnace. In the latter case, with careful patching after each heat, a bottom should last up to 1,000 heats. In the case of the air furnace some founders preferred to take off only three heats before renewing bottom, but in each case stated that they could take off more without risk, if they chose. Other founders got from 6 to 12 heats off their bottom, and these figures seemed to cover the majority of replies. The two exceptions were as follows: The first, with a natural draft air furnace, gave an efficiency of 30 heats from the same bottom. The second case, with a production of 29 heats of 14 tons, these bottoms were made by mixing ground fire brick with the fire sand.

While the method of making bottom as above described was the usual one, there were some slight variations. Thus, several foundries made the five-inch bottom all at once. One founder uses a top dressing of core sand one-half inch thick. Another uses salt or fire clay, or both, in his fire sand. Several add ground fire brick. All concur in emphasizing the necessity of thoroughly drying out each layer before the next is put on, and especially the junction between the old and the new sand on the bottom. In case the furnace foundation should draw dampness, it is advisable to erect a concrete box for the base, and fill in with broken fire brick before building up the furnace.

The word "fire-sand" is used advisedly, for it covers a number of appellations. Thus "silica-sand" is much used, though sand itself is silica of variable purity. Then "steel-sand," "glass-sand," lake sand, etc., all coming under the general head of a sand which is refractory to a high degree.

Finally the size of the heats as given by the replies to the circular inquiry are between 7 and 18 tons which would show the general practice in this respect. The further conclusion derived from this attempt to get first-hand information about a phase of foundry practice, is that more than enough in the way of a valuable return is gotten for the little trouble it took on the part of the individual foundrymen who replied, and who now have the opportunity to compare their practice with the general average.

MAKING HALF A TON OF MALLEABLE IRON.

E. K. asks how he can melt half a ton of malleable at a time, twice a day. Size of cupola etc. Apart from the economy of melting so small a quantity at all per day, when the molds can be kept for pouring every other day in one straight heat, we would say that to pour twice a day out of one cupola would mean charging a sufficiently large bed of coke on the last iron of the first part of the day's run to leave a bed which can be kept of proper depth when the second portion of the

day's work is put on for melting. This would amount to an ordinary heat interrupted in the middle.

The size of the cupola had better not be made less than 24 inches diameter inside the lining, the tuyeres at least 15 inches from the bottom, and the charging door eight feet above the bottom. A No. 2 Sturtevant Fan will give all the air necessary. To use an air furnace for so small a quantity would give even less economical results. You could, however, melt three tons in one heat at a time.

CORE MACHINE PRACTICE.

Editor of THE FOUNDRY:—In the January issue of THE FOUNDRY page 235, I notice an article headed "Core Machine Practice," where the writer takes exceptions to what you say in the December issue about a universal core machine. Now, I do not see why the writer should take exceptions without first furnishing positive proof the editor is wrong, as we cannot expect the editor to be an expert or a specialist in any particular branch of the foundry business; we would judge he gets his information from the manufacturers and inventors of the different machines, therefore, I would suggest that they be more careful and not say things that cannot be proven. The writer says, "what I have and do claim, is that it is impossible to make a core vented end to end, and after being forced through a die, have the ends tapered by squeezing, as it closes the hole and leaves no vent in the core." I think I voice the sentiment of the craft, when I say the writer should insert "this is impossible on *my machine,*" and let the balance of the machines take care of themselves. The writer is behind the times in making this assertion, as this has been accomplished for the last 15 years, and to prove this, I will cheerfully send by mail to any address, a sample core ¼ inch square 1¾ inches long with both ends tapered and a vent hole through the core with the drag end closed ready to drop into the mold. We will guarantee these cores will not vary in size or length one-thirty second of an inch (1-32″). These cores will be made with the automatic head attachment on the Diamond Universal Core Machine, and will be made at the rate of 16 per minute. The only reason for rating it at this speed, is the handling of the cores, as it is just as easy for the machine to make 32 per minute, as it is to make 16, providing the operator could take them away. So you see the speed proposition the writer speaks of is easily accomplished with the power machine.

I have heard and read so much about "we are the pioneers and we are the only ones who make a success of a machine," and I cannot see that there has been much progress made. I have a photograph of a core machine, that was taken in July, 1887 for making sand cores, also washing them with core wash; this was before the introduction of oil sand, when they used coarse river sand for making cores, and aside from the way the cores were delivered on a rod instead of a plate, you could not tell the machine from the present stock core machine. Now, if the editor of THE FOUNDRY will publish it and call it the original core machine, until some one out dates it, he is welcome to the photograph. What I think the foundry wants, is a general purpose machine, one that will make cores of all kinds, and finish them ready to drop into the mold, and I hope to be able to furnish a machine of this kind in the near future.

WM. N. GARTSIDE,
Prop. Diamond Clamp & Flask Co.

BANKING A CUPOLA.

Banking a cupola is so unusual an occurance, that a history of the incident, as it occurred with us recently, may perhaps be read with interest and the details of the experience may include information of value to some of your readers.

To a foundry man, the labor, loss, danger and annoyance incident to dropping the cupola bottom, particularly when the cupola is pretty well loaded, are too familiar to require rehearsing here, and they were what determined us to stop the machinery and to take our chances on banking the cu-

pola and running heat off next morning after the necessary repairs would have been made.

Our outfit in operation was a No. 9 Whiting cupola lined down to 58 inches. The bottom of tuyeres 12 inches above bottom, lower tuyeres only in use. No. 5 Baker Positive Pressure Blower supplied blast varying in pressure from four to seven ounces.

This pressure being insufficient for proper melting of iron, at the rate desired, a No. 9 Sturtevant fan was installed. It so happened that the position of the Baker blower was near the foundation for the new blower, so that a length of pipe made to run from the Baker to a point where the mouth of the new fan was to come made a return to the use of the old blower possible by the removal of the new blower from its foundation and the placing of the above mentioned pipe.

The way matters arranged themselves there was no time to test out the new installation before time to start blast. In starting the precaution was taken to keep the blast gate closed so as not to fan up the fire.

Trouble came with the start and five thirty came around and the machinery was still out of order. Upon consultation it was determined to bank the cupola.

The cupola was charged with 2,200 pounds of coke on bed and filled to the doors 17 feet up. The fire having been lighted at 11.55 in the morning and the banking was begun at 5.30, the cupola had been five hours and thirty minutes under draft.

The men were sent home and told to report at seven in the morning. The banking was accomplished by filling in the tuyeres with fresh coke further with rags and pounded tight with molding sand.

The top was packed in the same way with rags and molding sand forming a cover about six inches thick.

While the cupola was being banked

In the morning tuyeres and top were cleaned off and blast put on at 7.30, the first iron appearing fifteen minutes later. The first two hundred pounds were used for drying ladles, the next two hundred pounds for pouring grates and after that the iron ran white hot throughout the heat.

Hoping this recital may enable others to encounter a similar difficulty with more confidence, than we could feel with this, our first experience.

D. REIDENAUER.

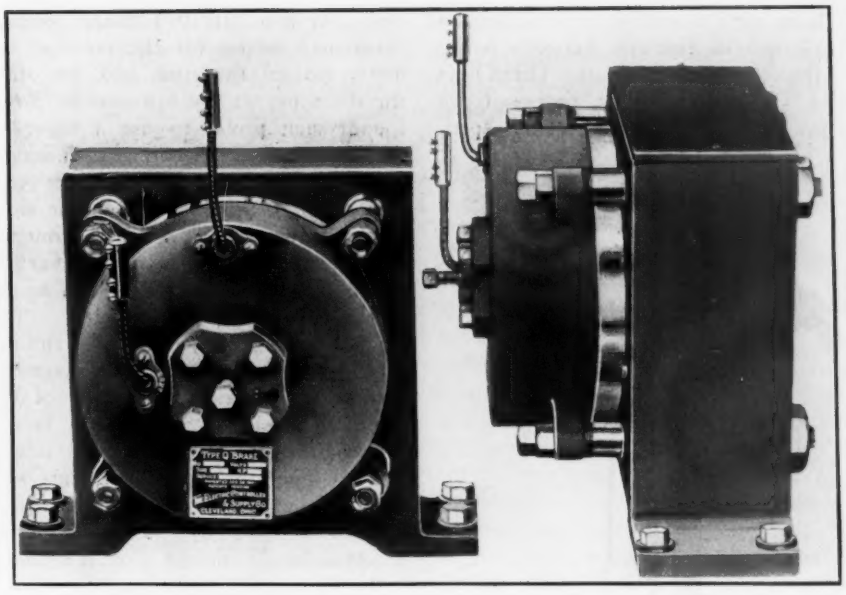
A NEW MAGNETIC BRAKE.

A magnetic brake is the latest production of the Electric Controller & Supply Co., of Cleveland. This is known as the type "Q" brake and is for use on electrically driven machinery of from one to 100 horsepower. Two metal friction plates are used which run in oil thus rendering the coefficient of friction constant under all conditions.

In all cases where electrically driven machinery requires frequent stops and reversals, the facility and speed of handling the material, and also the safety of the crane or other machinery employed, depends upon the accuracy and reliability of the brake. The braking force of the brake here illustrated is always a definite and constant quantity. It is applied axially and is balanced within the frame of the brake, thus allowing no blow or unbalanced thrust on the bearings of the motor.

The brake is released by an electromagnet through a very small air gap. This operates quickly with a comparatively small current and without any hammer blow. The braking force is always maximum and equally effective in either direction of rotation. The heat generated in braking is carried away from the friction surfaces by the circulation of oil and is then radiated from the entire surface of the friction case.

The adjustment of the braking force is easily made by means of the adjusting screw in the center of the spring cover. When the total amount of wear on all of the plates equals ¼ inch, a new square plate can be placed in the friction case by removing the magnet case and two top studs. The brake is



A NEW MAGNETIC BRAKE.

designed and tested to release on one half of full load current as a maximum. Due to the large pole area the brake does not drop back until about 1-10 full load current, insuring a continued release of brake until the current is entirely cut off.

The coil is entirely enclosed, thus being protected from the weather, from mechanical injury, grounding and short circuiting. The working parts are also enclosed and weather proof, insuring good service under all conditions of weather. The friction case is a square open box with supporting lugs. A cover is provided for the easy inspection of the working parts, and with a small opening on the motor side for removing the hub. The essential parts contained within this case are as follows; square stationary friction plates, prevented from rotating by studs at the four corners of the case but free to move laterally; circular moving plates supported by and keyed to the hub and free to move laterally.

The hub is made of steel with keys cut from the solid. It is supported by and firmly keyed to the motor shaft. An oil slinger is provided to throw oil inside the case and to prevent it running out at the hub opening. Lubricating oil is placed in the case to a depth of ½ inch below the lowest point of the hub opening.

The electro-magnet is mounted on the studs which prevent the stationary plates from revolving. The coil of this magnet is form wound, thoroughly insulated and treated with a vacuum and drying impregnating process which excludes all moisture from the coil and makes it weatherproof.

A CORE CONEING MACHINE.

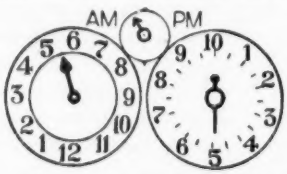
Most core rooms are not provided with power, and hence, if core machines are used and it is desired to introduce the coneing machine, either power must be provided, or the coneing machine must be operated by hand or foot power. If the machine is operated by hand, the operator has but one hand free to manipulate the core, and under the circumstances it is practically impossible to turn out perfect work. To overcome this difficulty the foot power coneing machine shown in the accompanying illustration, has been brought out. The machine is provided with two gauges which can be set to grind the taper on the two ends of the core. The makers fit up the machine regularly to make a taper 3-16 of an inch to the

inch on each side, that is, a difference of ⅜ inch in diameter between points on the core one inch apart. There have been various standards proposed for prints, but after considerable experimenting the firm manufacturing this machine has adopted in its own foundry the taper mentioned above, and a number of these machines have been sold and are apparently giving perfect satisfaction. As there are two gauges, one of them may be set for the taper at the upper end of the core, and the other for the taper at the lower end. Some foundrymen prefer to use a taper on the lower end of the core, which is one-half of that used on the upper end. The machine grinds cores on the sides of the emery wheel, while the outside diameter or face may be used for grinding tools, and will be found very handy in the core room and foundry. The machine has a capacity of handling cores from ⅜ to 2¼ inches in diameter. One of the special advantages of the machine as already mentioned, is the fact that it is operated by foot power and the operator has both hands free to manipulate the core. The machine is manufactured by the Falls Rivet & Machine Company, of Cuyahoga Falls, O., and is known as the Wadsworth Foot Power Core-Coneing Machine.

A CORE CONING MACHINE.

NAILING DOWN TIME.

One of the fruitful sources of disputes or controversies in many manufacturing plants is found in the actual amount of time spent on an order. If the workman is allowed to make out his own time slip and put down the time as he sees fit, he does it in such a manner as to make the best showing regardless of the actual time spent on the work. Frequently he will hustle one job to cover bad work on another, or he will make a new job bear the blame for the time he squandered talking with his mate while working on an established job, the time for which is known. This is the employer's side of it against the workmen, but all good workmen are equally interested in having a report of the time they actually spent on the job, and in being able to nail down the foreman as to the exact time a given job was placed in their hands.



In many shops when a man is given a job he is given a card which accompanies the job, and on which he is to record the time spent on it.

Any book-keeping system or cost finding system to be successful must reduce the amount of work necessary by the employes to a minimum, and in a good system an employe should never have to do anything but sign his own name. This means that some

device must be established for recording the time the job was received and the time it was finished.

The accompanying illustrations show the Perry time stamp and one of the records made by it. This stamp has a small clock in the upper portion of the case beneath which is situated the stamp proper and inking pad. When the pad stands in its normal position the clock is constantly moving the dials on the recording or stamping device. When the stamp is used the handle is pressed down, which immediately releases the clock mechanism from the recording dials. The next fraction of an inch of travel brings the recording faces or dials in contact with the ink pad, and still further pressure on the handle throws the ink pad out of the way and stamps the impression on the card or paper. It will be noticed that the clock was disconnected from the stamp mechanism by the very first pressure upon the handle, and hence the clock will not be injured or disturbed by the stamping. Next, the ink pad is not constantly in contact with the dials which adds life to both the inking pad and the dials.

The small figure showing the impression made by the clock shows a small dial at the top in the center. The little arrow in this dial indicates whether the record was made in the morning or in the afternoon. The left-hand dial indicates hours, and the right-hand minutes. This stamp gives a permanent record that there is no getting around. The workman should see when he receives his card that it has just been stamped, and he will lose no time in getting it stamped when the job is completed if he wants to make a good showing. A device of this kind certainly helps to prevent friction and tends towards accurate time keeping.

Phosphorus and Blow Holes.

I notice an article in the February issue of THE FOUNDRY in which it was stated by some one that phosphorus caused small blow holes in castings, which appeared when the castings were machined. My experience with high phosphorus castings has been simply that they were weak, especially when subjected to shock. The iron possesses greater fluidity and is more easily machined, but I have never known it to cause blow holes.

I believe if the chemist who claims such defects from that source will investigate more closely, he will find other causes than high phosphorus for blow holes.

CHEMIST.

Ornamental Patterns.

One of the subscribers to THE FOUNDRY desires to obtain a pattern for a life sized lion reclining, and we should like to obtain the name of a firm furnishing patterns of this class.

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When sending in articles be sure to place your name and address on the article and on the drawings.

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Trade Outlook.

In last month's Trade Outlook we reported that the outlook for summer's work was good, and, except for one cloud cast over all manufacturing industries by the possibility of a coal strike, the prospect is still very good.

The price for No. 2 foundry in the north is held at $17.00, valley furnaces, while the price on No. 2 southern has been reduced to $13.75 per ton, Birmingham.

It was stated in last month's FOUNDRY that the production was but slightly in excess of the demand, and these conditions still hold; a number of furnaces being out of blast and some others, particularly in the valley district, are banked, owing to the fact that they cannot obtain a sufficient supply of ore of suitable grade.

The steel foundries are reported to be very busy and it is interesting to note that a number of steel foundries using a crucible process for making small castings for automobile parts are being started in different locations. In fact, the small steel casting seems to be making serious inroads on the malleable iron industry. It has usually been supposed that it was the heavy malleable castings which were being replaced rapidly by steel castings, but the malleable foundries seem to have a larger proportion of heavy work on their books, while some of the light work foundries, or rather the medium weight foundries, are having difficulty to secure enough orders to keep them busy.

In the gray iron field both heavy and light work foundries are exceedingly busy. Specialty foundries are also very busy and it seems as though, in spite of the large increase in pipe foundry equipment during the past year, that there will be much more business than the pipe foundries can take care of.

Fuel Tests.

The readers of THE FOUNDRY will remember the mention which has been made in its columns of the experiments carried on by the United States government at the St. Louis Exposition, to determine the value of various fuels.

These investigations include test of the coking value of fuels, their value as material from which to make gas, also test upon the briquetting of coal.

At the close of the exposition, arrangement was made to continue the testing of fuels, the test plant continuing in operation. These tests have resulted in so much valuable information that the United States Geological Survey has now asked congress for an appropriation of $350,000 to enable it to continue the tests upon fuels, and also the tests upon building materials. It will be necessary first to move the fuel testing plant to some location where it will have permanent railroad facilities. The Geological Survey has most of the equipment necessary for the tests of building materials. These two lines of work should be carried on side by side by the Geological Survey for two reasons: First, the materials concerned are largely derived from natural products, consideration of which falls within the province of the Survey. Second, the Survey officials are thoroughly acquainted with the problem in hand, and also have a considerable portion of the equipment necessary.

The value of this work if carried out as it should be can hardly be estimated, as it will tend to conserve the resources of the country, and also to find methods by which many products now of no value can be rendered useful.

In connection with this work the Geological Survey has asked the various engineering societies of the country to name representatives from their bodies who would co-operate with the Geological Survey department in the carrying out of these tests, and all of the prominent engineering associations have complied with this request. The names of these co-operating engineers are among the greatest experts in their lines to be found in this or any other country.

Patterns for Large Work.

In another part of this issue we publish an article descriptive of the making of patterns and core boxes for a large engine bed. We know that beds of this type are frequently made with the use of skeleton patterns, or by patterns constructed in a different manner than here shown, and we shall be very glad, indeed, to receive articles discussing the method of construction and illustrating other methods by means of which this or similar patterns can be made successfully.

Convention of the American Foundrymen's Association.

The tenth annual convention of the American Foundrymen's Association is to be held in Cleveland, Ohio, June 5, 6 and 7, and cordial invitation has been extended by the foundrymen to all interested in the foundry trade to attend this convention. Cleveland is the largest gray iron jobbing foundry center in the United States. In addition to this there are many other points of interest to foundrymen in this vicinity. The city is centrally located for foundrymen from all regions. A very attractive series of papers has been promised, so that everything points to one of the best and most helpful meetings which has thus far been held. The entertainment features will not be forgotten, and the local foundry supply men have a plan on foot for an exhibit of supplies and equipments in connection with the convention. All supply men throughout the country will be given an opportunity to take part in this exhibit, and it will be one of the features of the convention. Special arrangements for the entertainment of the ladies are being provided, and it is hoped that all foundrymen will bring their wives.

Convention of the Associated Foundry Foremen's Association.

The Associated Foundry Foremen will hold their annual convention in Cleveland on June 4, 5, 6 and 7. The first session will probably be held Monday evening, June 4. Both the American Foundrymen's Association and the Foundry Foremen will meet in joint sessions during the week, and both associations will take part in the various excursions. One

feature of the convention will be a pattern makers' session which will be under the auspices of the Cleveland Foremen Patternmakers' Association. A number of good papers on pattern making subjects will be read at this time. All foundrymen throughout the country should see that their foundry foremen attend this convention, as they are sure to gain information which will be of value in their work. In some quarters false impressions have been spread abroad concerning this association. Both the A. F. A. and A. F. F. were organized purely for educational purposes, and neither association has anything to do with the labor problem. Both stand for the best foundry practice, and the object of the convention is to bring those interested in these foundry problems together to discuss the best methods of turning out work, and to exchange experience along these lines.

Exhibit at the A. F. A. and A. F. F. Conventions.

In January some of the Cleveland firms interested in the foundry supply business conceived the idea of an exhibit of foundry supplies and equipment manufactured in Cleveland in connection with the American Foundrymen's Association convention, to be held in June. The matter became known to several outside supply men, who stated that they would like to participate in such an exhibit. There has always been some small exhibit made at the hotel where the convention was held or in local foundries, but this is the first time that a concerted effort is made to produce a creditable exhibition.

On Saturday evening, March 17, ten men representing seven of the leading foundry supply manufacturers or dealers of Cleveland met at the Hollenden Hotel, and formed what is to be known as the A. F. A. Exhibit Association, the object being to exploit and carry on an exhibition in connection with the A. F. A. and A. F. F. conventions, June 4 to 7. Officers were elected, and it was arranged to form an association with $1,000 capital divided into $25 shares. As much of the stock as is necessary will be subscribed for by Cleveland parties, and the money thus introduced into the treasury becomes available to insure the expenses of the exhibition. A circular will be sent out to all outside men, requesting the amount of space desired and as soon as the total amount to be used is ascertained, a price will be fixed on the space which will cover the expenses of the exhibit.

It is hoped that the exhibition will pay all expenses so that the original subscribers to the stock will receive their money back, but the disposition of the stock insures the success of the exhibition. All exhibitors, whether Cleveland or out of town parties, are expected to pay for their space at the same rates independent of whether they are stockholders or not. By next month we hope to be able to report what progress has been made in connection with this exhibition.

The plan is to secure a building, or rather hall, that will contain sufficient room to hold both the exhibit and the meetings. The machinery will not be operated during meetings, but between the sessions. This arrangement has a two-fold advantage. In the first place, the exhibitors can be present at the meetings without feeling that they are neglecting their exhibit. Second, the exhibit will not take the members away from the meetings on account of the fact that the exhibit will be closed during the meetings.

All who have attended the successful conventions of the Railway Master Mechanics and the Master Car Builders at Saratoga, cannot help but approve of such a plan.

A Paper on Slags.

Mr. N. W. Shed, of the Foundrymen's Laboratory, E. Ferry street and Fillmore avenue, Buffalo, N. Y., writes us, stating, that he has been requested by Thomas D. West, president of the American Foundrymen's Association, to prepare a paper upon slags for the A. F. A. convention in June. In this connection he would like to receive samples of cinder from bad heats, from

foamy slag, or from any trouble which occurred in the cupola. Also samples of fluor spar, limestone, or any other flux. Samples should contain at least two ounces of material.

ASSOCIATIONS AND SOCIETIES.

New England Foundrymen's Association.

Fred F. Stockwell, Secretary, Care of the Barbour-Stockwell Co., Cambridgeport, Mass.

The New England Foundrymen's Association held their monthly meeting at Hartford, Conn., on Wednesday, March 14. About eighty members from out of town were present and there were one hundred and twenty-five, all told, in attendance, at the meeting.

Governor Henry Roberts and Mayor W. F. Henney were guests of the evening. Senator A. J. Sloper, treasurer of the American Hardware Corporation, was toastmaster.

Governor Roberts was introduced as the first speaker and welcomed the guests with a few appropriate words.

Mayor Henney was the next speaker and he dwelt especially upon the necessity of business men taking an interest in the affairs of the municipality in which they live.

Mr. O. P. Briggs, of Minneapolis, president of the National Founders' Association, then addressed the meeting on the subject of "The Best Means of Advancing High Grade Mechanics."

Three firms were received into membership, they being the Capital Foundry Co., Hartford, Conn.; W. & B. Douglass, Middletown, Conn.; and Frank W. Tilden, Hinsdale, N. H.

Philadelphia Foundrymen's Association

Howard Evans, Secretary, care J. W. Paxson Co

The March 7 meeting of the Philadelphia Foundrymen's Association was well attended, and a discussion of the threatened coal strike was one of the principal features of the evening.

Secretary Howard Evans announced that an invitation had been received from the Pittsburg Foundrymen's Association to visit that city on April 2, inspect some of the large industrial plants at Homestead and other places, and be the guests of the local foundrymen at dinner in the evening. The invitation was accepted, and a committee was appointed consisting of Dr. E. E. Brown, Secretary Evans, George C. Davis, W. O. Steele, William Hansen, G. Krug, J. H. Haldeman, Thomas Devlin, H. O. Evans and George C. Davies, to arrange for the trip and secure the attendance of as many members as possible. Promises to go were secured from a number of those at the meeting. It is proposed to leave Philadelphia on the evening of April 1, and after spending the day in Pittsburg to return home late Monday night, after the dinner, arriving home Tuesday morning.

Pittsburg Foundrymen's Association.

F. H. Zimmers, Secretary, Care Union Foundry and Machine Co., West Carson Street.

The next meeting of the Pittsburg Foundrymen's Association will be devoted to the entertainment of the Philadelphia Foundrymen's Association and the New England Foundrymen's Association and members of any similar organization in the country who will be present and accept the hospitalities of the Pittsburgers. At the regular monthly meeting of the Pittsburg Foundrymen's association held at the Hotel Henry, Pittsburg, Monday evening, March 5, the plans of the entertainment were discussed after a paper was read by H. E. Field, of Mackintosh, Hemphill & Co. This paper was freely discussed and a vote of thanks tendered Mr. Field, who is recognized as an authority on his subject, "Molding Sand," as well as on general foundry practice.

On motion by Mr. A. W. Slocum representing the Pittsburg Railway Club, a committee consisting of Mr. Slocum, J. S. Seaman and William Yagle, was appointed to confer with the Pittsburg Railway Club with the end in view of devising plans for the erection of a building in Pittsburg to be used as a club and place of meeting by members of the many technical and industrial associations. It was suggest-

ed by Mr. Slocum that the aid of Andrew Carnegie might be solicited toward erecting the building. The committee was appointed with the understanding that this action in no way bound the Foundrymen's Association to co-operate if the plan was not thought feasible.

Newark Foundrymen's Association.

H. L. Gebhard, Secretary, 36 Francis St.

The regular monthly meeting of the Newark Foundrymen's Association was held at Achtelstetters Banquet Hall on Wednesday evening, March 7. The section was devoted to foundry cost keeping. Secretary Gebhard first spoke on the absolute necessity of every manufacturing business having some system which would give an account or record of the cost of all articles manufactured. Papers, giving detailed information as to cost keeping in the foundry, were then read by Mr. Hannay, of the Oscar Barnett Foundry Co., and Mr. R. K. Wehner, of the Isbell-Porter Co. A lively discussion followed in which all of the members took part. The meeting was preceded by a dinner.

Philadelphia Foundry Foremen.

W. P. Cunningham, American Bridge Co., Sec'y

The fifteenth meeting of the Associated Foundry Foremen, of Philadelphia and vicinity, was held on March 12. These meetings seem to be growing in interest, and the association is in a very prosperous condition. All of those present took active part in the discussion as to how to induce molders to work steadily.

Cleveland Foundry Foremen

H. M. Lane, Browning Bldg., Secretary.

On Saturday evening, March 3, the Cleveland Club of Associated Foundry Foremen met in the parlors of the American House. Mr. W. M. Carr, of the Goldschmidt Thermit Co., of New York, was in town and attended the meeting. The entire evening was given up to general discussion, a portion of it being spent discussing foundry problems and the rest in the discussion of various matters relating to the A. F. A. and A. F. F. conventions to be held in Cleveland June 4 to 7.

Montreal Foundry Foremen.

Mr. J. F. Gaffney, care of Allis-Chalmers Bullock Co.

The regular monthly meeting of the M. F. F. was held on March 3. After the regular business was transacted, a very interesting paper was read by Mr. Walsh of the Canada Car Co. on "The Effect of Manganese on Low Silicon Irons."

Mr. Stoddard, vice president of the Detroit Testing Laboratory was present, and gave some valuable information in regard to the effect the blast has on iron, and the way the blast should be introduced into the cupola to obtain the best results. Everything points to a prosperous future for the Montreal branch of the A. F. F.

BUFFALO FOUNDRYMEN'S ASSOCIATION.
John E. Gorss, Secretary, 23 Builders' Exchange.

THE ASSOCIATED FOUNDRY FOREMEN.
Frank C. Everitt, care the J. L. Mott Iron Works, Trenton, N. J., Secretary.

NEW YORK FOUNDRY FOREMEN'S ASSOCIATION.
C. H. Thomas, 14 Elizabeth St., So. Norwalk, Conn., District Vice President.

ERIE FOUNDRY FOREMEN.
W. F. Grunau, Dist. Vice Pres., care Erie City Iron Works.

CHICAGO FOUNDRY FOREMEN.
Mr. Thompson, Link Belt Co., District Vice Pres.

MILWAUKEE FOUNDRY FOREMEN.
Sol. Shaw, care Clinton Street Foundry of Allis-Chalmers Co., Secretary.

CINCINNATI FOUNDRY FOREMEN.
E. W. Cadwell, Secretary, care S. C. Tatum Co.

INDIANAPOLIS FOUNDRY FOREMEN.
W. S. Keller, of Hetherington & Berner Co., District Vice President.

HAMILTON, ONT., FOUNDRY FOREMEN'S ASSOCIATION.
A. Chase, care Sawyer & Massey Co., Secretary and Treasurer.

New Commissioner of the N. F. A.

W. L. Herendeen, treasurer of the Herendeen Mfg. Co., Geneva, N. Y., has been chosen commissioner of the National Founders' Association. He succeeds to the place made vacant some months ago by the resignation of A. J. Caldwell. Since that time the duties of the office have been carried on by President O. P. Briggs and the assistant commissioner. The selection was made just prior to the opening of the National Metal Trades Association convention at Cleveland. Mr. Herendeen will devote practically his entire time to the position, but will continue to hold the office of the Herendeen company nominally.

Trade Publications.

The Pike Mfg. Co. of Pike, N. H., is sending out a very neat souvenir which is a combined paper weight and sharpener. It contains a circular card 5 inches in diameter to which are attached several sheets of blotting paper of very good quality. On top of the card there is a circular knife sharpener stone two inches in diameter, which is a small carborundum wheel. These souvenirs are sent out by the company on request.

The Dodge Mfg. Co., Mishawaka, Ind., has issued a book entitled, "Power Transmission Engineering," which is 6 x 9 inches, contains over 400 pages, is bound in a substantial manner and describes first the plant of the Dodge Co. very briefly, after which there follows a very full and well illustrated description of the various classes of power transmission equipment manufactured by this well known company. The book includes standard shafting, clutches, pulleys, chain and link belts, grooved pulleys for rope drives, belt conveyors and other specialties.

The Hanna Engineering Works, of Chicago, is sending out the sixth edition of its catalog No. 1 describing the Hanna pneumatic screen shaker and illustrating its various applications to foundry practice.

The Means Foundry and Machine Company, of Steubenville, Ohio, have issued a catalog 5½ by 7½ inches, entitled "The Means Brass and Bronze," in which there is a description of brass and bronze castings for boxes and bearings manufactured by the Means Company.

The United Coke & Gas Co., of New York City, has recently published a book describing the United-Otto system for making coke. The book goes into the subject very fully, indeed, and is of especial interest to those who are planning to install such a plant. The book is intended for use to managers, superintendents and chief engineers of industries allied with the coke business.

The Smooth-On-Mfg. Co., of Jersey City, N. J., is sending out a little compass on the bottom of which there is an advertisement of the Smooth-On compounds. This is certainly a neat and handy device.

The Kerrihard Co., of Red Oak, Ia., manufacturer of cast iron soil pipe, fittings, tools and machinery, is issuing a very acceptable calendar. In the upper portion there is an advertisement of the company and a picture of its works, and below a calendar of twelve sheets, one for each month, with good black figures 2 inches high which can be seen some distance.

Personal.

Hugh McPhee of the Eaton, Cole & Burnham Company, Bridgeport, Conn., gave a talk on foundry practice before the Y. M. C. A. of Bridgeport on February 28. He called attention to the fact that according to Biblical record, Hiram, King of Tyre, cast two columns of brass which were 27 feet high, 18 feet in circumference, and weighed 192 tons. This record of casting 3,000 years ago is one that would be hard to beat at the present date, and the question is, how did they manage to melt that mass of metal? He spoke of many other interesting phases of the molding question, and then exhibited some molds, which he cast with white metal, and

later shook out the castings for the audience to examine. Such talks as this should be exceedingly valuable in connection with any popular series of lectures, and would serve to familiarize the public with the interesting details of foundry work.

Mr. George M. Maddock has recently resigned his position as general superintendent and mechanical engineer for the A. L. Ide & Sons Co., of Springfield, Ill., and opened offices in the Marquette Bldg., Chicago, Ill. He will devote his time to the designing of new foundries, machine shops, etc., and also the remodeling of existing plants. He has broad experience, which should enable him to produce very good results.

A. H. Jameson has resigned his position as superintendent of the Providence Steel Casting Co., and accepted a position as superintendent of the steel casting department of the Malleable Iron Fittings Co. of Branford, Conn.

R. B. Coan formerly with the Becker-Brainard Milling Mach. Co., as clerk of the foundry, has resigned to accept a position as superintendent of the New England Steel Casting Co.'s plant at Hyde Park, Mass.

Martin J. Riley, assistant foreman of the Becker-Brainard Milling Mach. Co.'s foundry, has resigned to accept a position as foreman with the Kinsley Iron & Mach. Co., of Canton, Mass.

Geo. H. Foley has accepted a position as assistant foreman with the Becker-Brainard Milling Mach. Co.'s foundry at Hyde Park, Mass.

A. R. Lentz has resigned as superintendent of the Weatherby Foundry & Machine Co. to become superintendent of the Rebmann Iron Foundry, Williamson Bros. Co., Philadelphia, Pa.

C. C. Boyden, who has been the New England representative of Matthew, Addy & Co., has taken charge of the New York office of that concern.

William R. Fleming has resigned as president and general manager of the Harrisburg Foundry & Machine Works, Harrisburg, Pa., and has been succeeded by David Fleming.

Deaths.

Aaron Wissler, until recently proprietor of the Brunnerville, Pa., foundry and machine shop, died on Feb. 15, after a lingering illness of six years. Mr. Wissler was formerly in partnership with John H. Keller, but Mr. Keller retired in 1875 and from that time until 1905 Mr. Wissler conducted the business alone. In the fall of 1905 he sold the property to Frank E. Bentz, who now operates the foundry.

David Round, president of the Atlantic Foundry Co., Cleveland, died March 8 at his home in that city after several months' illness. He was born in Cradley, Staffordshire, Eng., in 1840, and 24 years later came to this country, locating at Troy, N. Y. In 1867 he went to Cleveland, where he established a chain making plant on a small scale and developed the business into the large industry of which he was the head at the time of his death.

Fires.

The foundry and machine shop of John R. Cook, Centerville, Md., was destroyed by fire Feb. 2 at a loss of $3,000.

New Construction.

The Downie-Wright Mfg. Co., formerly located at York, Neb., has moved to Rapids City, S. D. The company manufactures mining machines, and moved to locate in a mining region. The new plant will consist of several new buildings, including store room, foundry, machine shop and office buildings, and several other structures.

H. A. Silver and J. J. Dayner Jr., have purchased a site of ground in Salt Lake City, Utah, upon which the H. A. Silver Machine & Foundry Co. expects to erect a new plant.

The Thayer foundry of Atchison, Kan., has begun business under the new name of the Thayer Foundry Co. An addition 32 x 40 feet will be built to the foundry, and there will also be another addition added later for a sash weight department.

The Waterman Car Wheel and Foundry Co., Houston, Tex., has two buildings practically completed, one 96 x 220 feet, and the other 50 x 100 feet. They state, however, that it will probably take until September next to install all of the equipment and get the plant into running order.

J. B. Green, proprietor of the Des Moines Stove Repair Co., of Des Moines, Iowa, has purchased some additional property upon which he will erect several new buildings, including a foundry, pattern shop, store room, etc.

The Chicago Hardware Foundry Co. will erect a $12,000 addition to its foundry in North Chicago in the near future. The building will be 65 x 100 feet.

General Industrial Notes.

The Brown-Corliss Mfg. Co. located at Corliss, Wis., which went into bankruptcy some time ago, has been sold for $90,000 cash and subject to $250,000 encumbrances on the real estate. The purchasers are: W. H. Nimick, J. B. Shea and Otis H. Childs of Pittsburg, Pa. They will reorganize the company under the name of the Wisconsin Engine Co. and begin operating at once.

The Carthage Foundry & Machine Works, of Carthage, Mo., has elected the following officers for the ensuing year: John Gillham, president and general manager; J. L. Moore, vice president and treasurer, and F. L. Moore, secretary.

The stockholders of the Sioux City Foundry & Mfg. Co., of Sioux City, Ia., elected at their annual meeting the following officers: Milton Perry Smith, president and treasurer; R. H. Burton-Smith, secretary. The company has recently purchased five acres of land near the Great Northern tracks in Floyd valley, with the idea of removing its plant to the new location at some time.

The Atlas Foundry & Machine Co., of Tacoma, Wash., has elected the following officers: president, George Dupea; vice president, Wilson Webb, and secretary-treasurer, John Hartman.

The Advance Machinery Co., of Deadwood, S. D., has purchased the entire plant of the Downie-Wright Co., of York, Neb., and will move it to Rapid City, S. D., where it is expected that it will give employment to about 200 men.

The Climax Stove & Foundry Co., of Coffeyville, Kan., has been formed, mainly with local capital. The officers are George Francis, president; W. T. Read, vice president; Ed S. Rea, treasurer; J. Ellis Patterson, secretary and general manager.

The Smith's Falls Foundry & Malleable Co., Ltd., of Smith's Falls, Ontario has been incorporated with a capital of $100,000.

It has been announced that the Thew Automatic Steam Shovel Co., of Lorain, O., will double the capacity of its plant by constructing several new buildings, including a foundry.

At the annual meeting of the Wheeling Mold & Foundry Co., of Wheeling, W. Va., the stockholders voted to increase the capital stock of the company from $200,000 to $500,000. Arrangements will be made at once for the increase in the capital stock and a stock dividend of 50 per cent will be declared. The charter has been changed to permit this. The statement for the past year shows the company to be in excellent condition.

The Sheffield Steel Range & Stove Co., of Sheffield, Ala., has been organized with a capital of $50,000. The officers are John Donk Jr., president; R. R. Hill, secretary and manager and S. B. McTyer, treasurer.

The Industrial Machine Works, of New Orleans, La., has been incorporated with a capital of $50,000 to operate a brass and iron foundry. The incorporators are E. M. Loeb, Isidore Kohlmayer, J. B. Strauss, Percy Stern and Charles Weinberger.

Chas. Roemer, who purchased the foundry and machine works of L. C. Heminger, of Bowling Green, Ky., some time ago, is now in charge of this plant and ready to make castings.

The annual election of officers of the Anderson Machine & Foundry Co. of Anderson, S. C., resulted in the selection of the following: A. S. Farmer, president; R. E. Ligon, vice president;

T. A. Wigginton, secretary and superintendent. At the annual meeting of the stockholders of the Centre Foundry & Machine Co., of Wheeling, W. Va., the following directors were elected: W. E. Stone, Geo. Wise, N. E. Whitaker, C. R. Hubbard and John Klari.

The Clarkston Foundry & Iron Wks, of Clarkston, Wash., which has been under construction for some time, is practically completed and the new machinery is now being installed.

The Jellico Foundry & Machine Co., Jellico, Tenn., has been incorporated with a capital stock of $25,000 by W. P. Richards, W. T. Barker, Wm. Brown, O. French and A. T. Richards.

The Cragin Iron Foundry Co., Camden, N. J., has been incorporated to manufacture machinery, castings and other foundry products. The capital stock is $125,000 and the incorporators are: Morgan J. Cragin, Joseph H. Carter and Alexander H. Heyman, all of 419 Market street, Camden.

The Elizabethport Brass Foundry Co., Elizabeth, N. J., incorporated for $25,000, by Frank J. Freund, and Charles F. Hinde of New York and Walter J. Rose of Elizabeth.

The Bucyrus Steel Casting Co. has awarded the contract to the Indiana Bridge Co., Muncie, Ind., for the structural work of the new steel foundry which it will erect during the spring. The building will be 145 x 300 feet, modernly equipped, and will be ready for operation late in the year.

The North Lebanon Foundry Co., Lebanon, Pa., has completed additions which double the capacity of its plant in brass and iron castings. J. H. Wilborn is superintendent.

The Western Machine & Tool Wks., Holland, Mich., concerning the report that it is to erect a new foundry, states that it will not build until late in the summer, if at all.

Woodruff Bros. have withdrawn from the Winder Fdy. & Machine Works, Winder, Ga., and will begin at once the erection of a foundry and machine shop under the name of the Woodruff Hardware & Mfg. Co.

The Donaldson Iron Co., Emaus, Pa., is to erect a large additional foundry which will enable it to produce pipes up to 36 inches in diameter.

The Universal Castor & Foundry Co., Newark, N. J., is planning the erection of an additional three-story building in the spring. It recently completed extensive improvements, including a large three-story building for the pressed steel department and storage purposes and an addition 50 x 100 feet to the foundry.

The American Foundry Co., South Framingham, Mass., has been incorporated with a $10,000 capitalization to conduct a foundry business. T. J. Cahill is president, T. F. Raymond treasurer and R. M. Raymond clerk, all of South Framingham.

The A. W. Wheaton Brass Works, 142 Market street, Newark, N. J., has incorporated with $100,000 capitalization, to deal in iron, steel, brass and other metals and to manufacture castings and fittings. Abram W. Wheaton, 902 S. 17th street, New York, is at the head of the new company.

The Friberg Iron Foundry, Brooklyn, has been chartered with a capital stock of $5,000 to manufacture castings and conduct an iron foundry. The incorporators are: Charles A. August and Ernest E. Friberg, both of Newdorp, Staten Island.

The Bond plant of the American Radiator Co. at Buffalo is rapidly nearing completion. The assembly building is of steel, concrete and tile construction, 100 feet by 200 feet. The pattern shop is 100 by 175 feet. Plans for other buildings are under advisement.

The Atlas Brass & Copper Co., Trafford City, Pa., recently incorporated with a capital stock of $750,000, will erect a large plant for the manufacture of copper and brass tubing, sheets, rods, etc. The president of the company is James Hay, also president of the Ruud Mfg. Co., Pittsburg, Pa. It is stated that a large part of the output will be used in the manufacture of the Ruud heaters.

The Buffalo Steam Pump Co., Buffalo, N. Y., is erecting an addition, 80 x 200 feet, to its foundry. A cupola house and core shed will be attached.

William S. Cleaves, president of the

Portage Lake Foundry & Machinery Co., of Houghton, Mich., has purchased the capital stock of the Hodge Iron Co., of that city. The transfer carries with it the entire plant, stock and business of the Hodge company, which will be operated hereafter under the personal charge of Mr. Cleaves. The officers of the company will be identical with those of the Portage Lake Foundry Co., as follows: W. S. Cleaves, president; George A. Royce, secretary; L. M. Cleaves, treasurer. The foundry was built in 1869 for the use of the Calumet & Hecla Mining Co.

The Loy-Wilson Foundry & Machine Co., Aurora, Mo., is erecting a foundry 48 by 66 feet, a machine shop 36 by 80 feet and a blacksmith and power shop 36 by 48 feet. The company has purchased the Chanute Iron Works of Chanute, Kan., which will be removed to Aurora. Its specialty will be the manufacture of cable plunger pumps. Some new machinery will be required.

There is stated to be a good opportunity for the establishment of a pipe foundry for the manufacture of soil and small size cast iron pipe, in Duluth, Minn. Over 12,000 tons of this material have been contracted for already this year, and probably a still larger quantity will be needed.

J. A. Armstrong, of Connellsville, has been elected to the directorate board of the Scottdale Foundry & Machine Co., Scottdale, Pa. F. A. Ryder, general manager, has resigned and E. L. Rutherford has since been in charge of the plant.

The Eberhard Mfg. Co., Cleveland, has purchased the plant, stock and good will of the Racine Malleable & Wrought Iron Co., of Racine, Wis. Rumors to the effect that this transaction was concluded by a group or syndicate of buyers were incorrect. The purchase was made by the Cleveland concern alone and for its own exclusive use in connection with its increasing northwestern business in malleable iron, carriage, wagon and saddlery hardware.

The Buffalo Crucible Casting Co., Buffalo, N. Y., has been incorporated with a capital of $150,000 to manufacture crucible steel castings. The directors are: W. A. Torne, E. G. Ripple of the Buffalo Foundry Co., and J. L. Osgood of the Erie County Bank building, Buffalo.

The Eureka Mfg. Co., Lincolnton, N. C., has incorporated for $25,000 to operate a machine shop and foundry. The officers are: J. L. Lineberger, president; W. A. Biggs, secretary, treasurer and general manager.

The Acme Steel & Malleable Iron Works, Buffalo, N. Y., has practically completed a large addition to its foundry which will increase its present capacity to about 10,000 tons.

The Baker & Shevlin Co., Saratoga Springs, N. Y., has practically completed a 40 by 108 feet addition to its foundry which will increase its malleable iron capacity 20 per cent.

The Lenoir City Car Works, Lenoir City, Tenn., has increased its capital stock from $200,000 to $250,000, and will make additions to the plant which will enable it to turn out about 20 cars per day.

The Pilgrim Foundry Co. has removed from Seaside, Mass., to South Boston, Mass.

Cast steel is being used in a field which was formerly filled exclusively by cast iron; namely, the construction of locomotive cylinders and saddles. The Penn Steel Casting & Machine Co., of Chester, Pa., recently cast and finished several steel cylinders for the New York Central Railroad. One of the advantages found in these cylinders was that thinner sections could be used than in cylinders made from cast iron.

George A. Mesker, Evansville, Ind., is building an additional two stories, 150 x 180 feet, to his foundry at a cost of $75,000. It is of brick and steel construction.

The Belle City Malleable Iron Co., Racine, Wis., has completed a molding and enameling room 60 x 120 feet and is said to be considering the practical rebuilding of its entire plant.

The plant which is being erected at Pullman, Ill., for the Griffin Wheel Co., consists of a large and modern car wheel

foundry with an electric power plant and all necessary adjuncts. The site is about thirty acres in extent and is located on the tracks of the Pullman railway. It is expected that the plant can be placed in operation in the near future with a capacity of 500 wheels per day. The Griffin Wheel Co. has two other foundries in Chicago and six in other sections of the country.

The National Radiator Co., Johnstown, Pa., has increased its capital stock from $100,000 to $350,000, and has closed a deal with the Lorain Steel Co. for the purchase of one and one-half acres of additional land on which extensions and improvements to the present plant at a cost of between $75,000 and $100,000 are planned. Among the improvements will be an extension to the foundry which will double the capacity and a new warehouse several times the size of that now in use. Samuel B. Waters is president and John H. Waters, secretary and treasurer.

The American Wood-Working Machinery Co., Aurora, Ill., is planning a large addition to its foundry building. The company is just now completing a building of similar size.

The Caldwell Mining Car & Foundry Co., Caldwell, O., has been incorporated with a capital stock of $20,000. The incorporators are: J. J. Jones, J. J. Schuler, C. J. Hodge, David Friedman, David Quick and H. L. Hastings.

The Sims-Kent Co., recently incorporated at Dover, N. J., to conduct a steel foundry business, will at once begin the erection of a plant. The foundry proper will be one story of steel construction, 60 x 160 feet. There will also be an office building, machine shop, pattern shop, storage, engine and boiler shops. M. Sims is president, J. W. Kent, secretary and treasurer and J. B. Lydecker, sales manager.

The Medina Foundry Co., Medina, O., has been incorporated with a capital stock of $25,000. The incorporators are: T. E. Henry, O. C. Scheible, W. H. Hobart, C. J. Miller and L. M. Matz.

The Peerless Foundry, Hamilton, O., has been incorporated for $25,000 by John Richard and S. H. Flum, F. M. Snook and Frank J. Baker.

The Novelty Foundry & Machine Works, Nashville, Tenn., has been incorporated with a capital stock of $35,000. The incorporators are: L. M. Shepherd, T. O. Perkins, J. A. Burton, E. H. Roy and A. P. Foster.

Gohmann Bros., Kahler & Co., stove manufacturers at New Albany, Ind., have purchased a site for a new foundry building which will be of brick 60 x 400 feet.

The Hendey Machine Co., Torrington, Conn., has practically completed its new shop building 80 x 110 feet, to which it will soon remove the machinery in its old plant. The old shop will then be removed and in its place further building will be done. The new building when completed will be 110 x 220 feet. Extensive additions to the foundry are already under way.

The Phoenix Fdy. Co., recently organized at St. Joseph, Mo. by Henry, William and Robert Blum and F. M. Atkinson, is having plans prepared for a foundry building 50 x 200 feet, which with equipment will cost in the neighborhood of $20,000. Robert Blum, who is a practical foundryman, will have charge of the plant.

The Punxsutawney Foundry & Machine Co., Punxsutawney, Pa., recently incorporated for $150,000, has taken over the business and plant of the Novelty Iron Works and the Punxsutawney Machine Co. Both plants will be operated as heretofore, manufacturing mine cars, light locomotives, mine and mill supplies and doing general foundry work.

John J. Davison has resigned as assistant superintendent of the Lorain, O., foundry.

The United States Brake Shoe Co., which was incorporated with a capitalization of $500,000, it is announced, will locate an extensive plant at Green Island, near Troy, N. Y. The officers of the company are: Thomas H. Campion, of Troy, president; Chas. Neilson, of Baltimore, vice president; Henry B. Corey, of New York, treasurer, and R. R. Marchant, of Baltimore, secretary. The patent brake shoe for the railway cars, invented by L. E. Robinson, a director of the company, will be manufactured.

The plant will be established in the old plant of the Security Steel & Iron Co., on Green Island.

E. B. Gilmore & Co., Peoria, Ill., is to incorporate for the operation of the idle foundry of the John Hutchinson Foundry Co., Jackson, Mich., which it has leased.

Love Bros., of Aurora, Ill., have acquired the old smelting plant in that city and will utilize it for foundry purposes. Plans are being prepared for the rebuilding of the plant, which will be operated on a large scale. The property includes a site of 20 acres.

The Standard Foundry Co., Worcester, Mass., has been incorporated with a capital stock of $10,000. The officers are: Frank S. Williams, president, and Thomas F. Booth, treasurer.

The Ashtabula Foundry Co., Ashtabula, O., has been incorporated with a capital stock of $100,000. The incorporators are: John F. Mills, Thos. Fitzgerald, E. P. Hall, Fred E. Crosley and Julius F. Munsell.

The Thomas Somerville Co., 316-322 Thirteenth street, N. W., Washington, D. C., has been incorporated for $80,000 to conduct an iron and brass foundry.

The Bowman Foundry & Machine Co., Philadelphia, has been incorporated in Delaware to purchase and acquire lands for the erection of machine foundries. The capital stock is $100,000.

The Trojan Brake-Shoe & Foundry Co., Troy, N. Y., incorporated with a capital stock of $50,000, will manufacture brake-shoes, etc. The incorporators are: James H. Caldwell No. 55 First street; Thomas H. Campion, No. 223 Eighth street; Cornelius F. Burns, No. 10 Fourth street; Thomas S. Fagan, No. 627 Grand street; Richard Kellogg, No. 62 Second street, all of Troy, N. Y.

The J. A. & P. E. Dutcher Co., Milwaukee, Wis., has let a contract for a 12-ton open-hearth steel furnace to the Meredith Bros. Co. This will increase the capacity of its present plant about 50 per cent and will necessitate considerable new building.

The American Steel Foundries is preparing plans for extensive additions to the foundry department of the plant at Granite City, Ill. The machine shop will be moved to other quarters, the car shop will be lengthened by 200 feet and additions will be made to the departments for chipping and finishing castings. Other improvements will raise the total cost of building now contemplated to about $200,000.

The Southern Car & Foundry Co. has under construction at Beaumont, Tex., a warehouse 27 x 106 feet to contain the blacksmith and pattern shops. The machine shop of the company is also being enlarged. Wm. Rentfrow is in charge of the improvements.

The Nordberg Mfg. Co., Milwaukee, Wis., is to erect an addition to its machine shop 80 x 300 feet high and add considerably to the area of the pattern shop. These buildings will be of brick, steel and concrete. They will involve an expenditure of about $65,000.

The additions recently made to the plant of the Belle City Malleable Iron Works, Racine, Wis., are now completed. They include a new foundry building 76 x 200 feet, with an addition to the annealing room 80 x 100 feet. The core, trimming, tumbling and shipping departments have been increased in like proportion, with the result that the company's output is now at the rate of 10,000 tons annually as against 4,000 to 5,000 previously. The plant is working to its full capacity with its entire tonnage booked for eight months ahead.

The additions recently made at the plant of the Sibley Machine Tool Co., South Bend, Ind., have increased the floor space of the foundry about 8,000 square feet, and the machine shop 4,000 square feet. Seventy-five additional men will be employed. Equipment has been purchased.

The Waterbury Metal Co., Waterbury, Conn., which has just been organized, has secured a 12-acre site in that city and will erect three large buildings, one of them a casting shop 50 x 100 feet, containing 20 furnaces.

Plans have been prepared for the enlargement of the foundry of the Aurora Iron Works, Aurora, Ill., by the erection of a pattern shop, store house and other buildings.

The car wheel foundry of the Chicago,

Milwaukee & St. Paul railway at West Milwaukee, is to be enlarged with the idea of increasing the capacity from 185 wheels daily, as at present, to 400 wheels per day. This will involve the construction of several new buildings. New and enlarged car and locomotive shops are also planned by the company, but their location is as yet in doubt.

The White Foundry & Machine Co., Anniston, Ala., is erecting a small foundry which will be added to later.

The Scoville Mfg. Co., of Waterbury, Conn., manufacturer of brass and copper goods, has voted to increase its capital stock by $812,500, making the total capitalization over $4,000,000. The newly elected board of directors chose the following officers for the ensuing year: Chauncey P. Goss, president and treasurer; Frederick J. Kingsburg, vice president; Mark L. Sperry, secretary; T. R. Hyde, assistant secretary; Edward O. Goss, assistant treasurer.

The Pacific Iron Works Co., of Bridgeport, Conn., has been sold and the new company has elected the following board of directors: General Henry A. Bishop, William E. Burnham, Frederick J. Kingsbury, Preston H. Skidmore, and Frederick Parkhurst. Mr. Burnham has been elected president. The active management of the concern will be intrusted to Messrs. Skidmore and Parkhurst. The company manufactures iron castings and carries on a general foundry and machine business.

Operations were begun at the plant of the Green Ridge Brass and Iron company of Scranton, Pa., on March 1. The three men most actively engaged in the enterprise are: William F. Hughes, J. P. McCartney and John McAndrews.

The new brass foundry of the Mitchell & Van Meter Co., of Pottstown, Pa., was started recently and the first brass castings made. The company now employs 60 men, and the force will soon be increased. Mr. John J. Ward of Baltimore, who was formerly conected with the McShane Brass Foundry & Manufacturing Co. is the superintendent of the new plant.

The Keystone Steel Co. has purchased the plant and equipment of the Farmers Mfg. Co., of Sebring, O., and will continue to operate the plant under the name of the Keystone Steel Co., making feed cutters and other tools and machines. The plant includes a machine shop, pattern shop and foundry.

Mr. M. F. Gartland of Marion, Ind., who, with his brother, operates a foundry in Terre Haute and in Marion, Ind., has purchased an incomplete foundry building in Kankakee, Ill., and will organize a new company under the laws of Illinois, which will probably be known as the Kankakee Foundry Co., with a capital stock of from $50,000 to $100,000. The foundry will be operated in connection with those already owned by the gentlemen interested.

The stock of the Thomas White Stove Co., of Quincy, Ill., which was held largely by the heirs of the late Thomas White, has been disposed of to a number of Quincy men, the principal portion having been purchased by Chauncey H. Castle and Joseph W. Emery. It is stated that the foundry will be conducted under the old name and independent of other foundry interests owned by the new purchasers.

The Fox River Iron Co., of Aurora, Ill., has been incorporated with a capital of $75,000 to conduct a general foundry business. The incorporators are: Joy Love, John P. Love, G. A. Linington.

Ex-Mayor Duisdeiker, proprietor of the Duisdeiker Foundry Co., of Peoria, Ill., is making extensive changes in his foundry, including the installment of a new thirty-five horsepower engine.

The Bachman Foundry & Machine Co., of Austin, Tex., has filed an amendment to its charter changing the name to the Tips Foundry & Machine Co. The officers under the new name are: A. C. Goeth, president; Charles Gardner, vice president; A. Giesen, treasurer; Eugene Tips, secretary. The company contemplates no change in its business, but will continue to operate as a general foundry and machine company.

The Cost of It

The expense of a modern system of cost-keeping need be no greater than a crude, antiquated and inefficient way of keeping accounts.

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Production Engineers and Public Accountants.....

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My East Indian Elephant recognizes the necessity of being on the "front seat" at all times and the plumbago he is bringing over fills the long-felt want you read about.

Its use gives pocket-book satisfaction to foundrymen all over the land.

The good appearance of a casting is not only easily produced with its use, but it is so produced with less cost, less quantity used, less labor on the mold, less labor in cleaning the casting, all of which is less strain on the pocket-book; hence, pocket-book satisfaction. Try a barrel at my risk.

The same element of quality pervades everything coming from my shop, and I have "Everything for a foundry."

FREDERIC B. STEVENS

Cor. Larned and Third Sts.,
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